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XXIV.—ON THE BALSAMINACEAE OF THE STATE OF CHITRAL.

J. D. Hooker.

Geographically the State of Chitral is of interest as occupying the limited area in which the four great Asiatic dominions approximate or meet, British on the south-east, Afghanistan on the west, Russian on the north-west and Chinese on the north-east. Its latitude, 34–36° N. and longitude 71–73° E., reach the extreme north of the British possessions in Asia. Botanically it occupies the extreme north-west of the Himalayan flora. It is a mountainous member of the great Hindu Kush range, consisting of barren stony tracts alternating with cultivated valleys, limited forests, pastures and naked or snow-capped peaks. The indigenous flora commences at an elevation of 3000 ft. and ascends to between 14,000 and 15,000 ft., and is described as remarkable for the prevalence in summer and early autumn of species of *Impatiens* at medium elevations.

The collections from which a knowledge of the flora of Chitral has been obtained have been formed almost exclusively by officers of the British and Indian armies engaged in military operations in and after 1895, the year of the despatch of the Chitral Relief Expedition, up to and inclusive of which year more than 924 species (upwards of 800 of which are flowering plants) had been collected, as recorded by Mr. Duthie, F.L.S. (late Director of the Botanical Department of N. India), in a valuable essay entitled "The Botany of the Chitral Expedition, 1895," published in the "Records of the Botanical Survey of India," Calcutta, vol. ii. (1898), p. 140. In the pages prefacing that essay Mr. Duthie has discussed the physical features, climate, &c. of Chitral, and mentions General Gatacre, C.B., D.S.O., in command of the advanced brigade, as having, with

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the co-operation of Surgeon Lt.-Col. Hamilton, collected botanical specimens from the commencement of the campaign. He includes a few species collected in 1894 by Capt. (now Col.) Sir Francis Younghusband, K.C.I.E. More recently an extensive, carefully ticketed and beautifully preserved herbarium of Chitral plants has been formed by Lt. Toppin, R.A., who has kindly sent to me the Balsams it contained, and who, having been transferred to Burma, has induced two brother officers remaining in Chitral, Major Wall and Lt. Stirling, to collect for me. I am already indebted to these gentlemen for two species, one, *I. Thomsoni*, not found in Chitral by other collectors.

In Mr. Duthie's essay six species are enumerated, of which three are correctly identified, *I. Balsamina*, *I. Roylei*, and *I. brachycentra; I. amphorata*, Edgew., is *I. Lehmanni*; *I. laxiflora*, Edgew. and *I. scabrida* are, I think, both *I. Edgeworthii*.

The North-West Himalayan flora which extends from the Nepal frontier to Afghanistan contains, as at present known, nearly 40 species of *Impatiens* of which only about eight have been found east of Nepal, in Sikkim, where about 80 species in all have been collected. No doubt many both of the N.W. and Sikkim species enter Nepal, which itself must contain many endemic forms of the genus in the thousand miles of the Himalaya that it covers, and which are a terra incognita geographically and botanically. Of the Chitral species two alone, *I. Balsamina* and *I. Thomsoni*, are found eastwards as far as Sikkim.

Returning to the north-west, the Chitral Balsams no doubt enter the conterminous Afghan northern province of Kaffristan and there disappear, the climate of the western and southern regions of that kingdom, as of Persia, being prohibitive. No Himalayan member reappears in the Caucasus, where the only species known to me is *I. nolitangere*, L., which ranges continuously from Britain to Japan but nowhere enters India. It is remarkable that *I. bicolor*, Royle, which is perhaps the most common N.W. Himalayan species at 4000 to 11,000 ft., has not been found in Chitral.

To the following list of Chitral species I have added their distribution and brief diagnoses which will enable an amateur in Chitral to recognise them. The leaves of all, except *I. Roylei*, are alternate.

A. Inflorescence simply pedicelled in the axils of the leaves.
**Flowers white, rose-pink or purplish.*

1. *I. Balsamina*, L.; leaves lanceolate, serrate, flowers pink, capsule short, densely tomentose.
Alt. 4000–5000 ft. *Hamilton, Toppin.*
Distrib. throughout India, Malaya, China.

B. Inflorescence peduncled, peduncles 2—many-flowered.
**Flowers white, rose-pink or purplish.*

2. *I. Roylei*, Wahl.; leaves opposite, alternate, and whorled, serrate, flowers white and pink or purple, capsules short, clavate, glabrous, deflexed.
Alt. 6000–10,000 ft., *Gatacre.*
Distrib. southward to Murree and eastward to the Nepal frontier.

3. *I. Lehmanni*, Hk. f. et Thoms.; leaves ovate, crenate, pedicels subumbellate at the top of the peduncles, flowers rose-coloured or purplish, variable in size, capsule linear, decurved or deflexed.

Alt. 7500–11,000 ft., *Gatacre*, *Harriss*, *Toppin*, *Wall* and *Stirling*.

Distrib. E. Afghanistan southward to the Kurrum Valley and Cabul.

4. *I. Flemingii*, Hk. f.; leaves ovate, serrulate, bracts minute, flowers small, white or pale pink, capsules slender, erect.

Chitral, *Gatacre*, in Herb. Hort. Petrop.

Distrib. southward to Murree and eastward to Kiashtwar.

5. *I. Thomsoni*, Hk. f.; leaves ovate, crenate, bracts at base of pedicels elongate, very narrow, flowers rose-coloured or purplish, capsules linear or subclavate, deflexed.

Chitral, *Wall* and *Stirling*.

Distrib. throughout the Western Himalaya; alt. 8000–10,000 ft., also Sikkim.

6. *I. Harrissii*, Hk. f.; leaves ovate, crenate, peduncles 2-flowered, bracts ovate-lanceolate, membraneous, flowers rose-coloured? capsules short, narrow. A doubtful species.

Chitral, *Harriss*, in Herb. Hort. Petrop.

7. *I. brachycentra*, Kar. et Kir.; leaves crenulate or crenate-serrate, peduncles many-flowered, flowers very minute, white, capsules slender, erect, clavate.

Alt. 7000–9000 ft., *Gatacre*, *Harris*, *Toppin*.

Distrib. southward and westward to Kurrum Valley, Afghanistan, and eastward to the borders of Nepal, ascending to 14,400 ft.; also Alatau Mts. in Russian Asia.

**Flowers golden-yellow.*

8. *I. Edgeworthii*, Hk. f.; leaves ovate, crenate-serrate or serrulate, peduncles few, or many-flowered, bracts persistent, flowers 1·5-2·5 cm. broad, lower lobe of lip produced upwards into a straight or decurved lobule, capsules linear or clavate, erect—very variable in size and habit.

Alt. 6000–8500 ft., *Gatacre*, *Harriss*.

Distrib. S.E. to Kulu; alt. 3000–9500 ft., frequent.

XXV.—NOTES ON TREES SUITABLE FOR EXPERIMENTAL FORESTRY.

W. Dallimore.

Though but a small number of trees are grown to any considerable extent under forest conditions in the British Isles, there are others which would be well worth a trial, for it is probable that some of them would turn out to be quite as useful as the few exotic species which hold their own with native trees in our woodlands, were they planted under similar conditions. Considerable support is given to this idea by much that has been written and by recommendations which have been made, with regard to British forestry, during the last few years, for among trees which have been spoken highly of for general planting, there are at least two, Douglas fir and Sitka spruce, which have but recently emerged from the experimental stage as regards forest

planting, though they have been known as good ornamental trees for many years. It is also of interest to note that the forest authorities of several countries where afforestation is being conducted on systematic principles, have found that certain exotic trees give better results under some conditions than native species. For evidence of this, attention may be directed to the planting of Australian Acacias and Eucalypts and *Pinus canariensis* and *P. halepensis* in South Africa ; the substitution of various North American, European and Australian, for native trees in New Zealand, (*see* Report on " State Nurseries and Plantations " for the year ending March 31st 1910, issued by the Department of Lands, New Zealand), and the " Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii " for the biennial period ending December 31st 1910, in which the following paragraph occurs on page 39 :—" The native Hawaiian forest is, as has been pointed out earlier in this report, of the greatest value as a watershed cover, but from the commercial standpoint much better results can be got from introduced species than from Hawaiian trees."

The fact that certain timber trees which are of commercial importance in their native countries give excellent results when grown as ornamental trees in the British Isles, would appear to be a sufficient guarantee that they will thrive under silvicultural conditions in the same localities ; but it would not be safe to recommend extensive plantations solely on that account. It is necessary to find out first whether such trees possess an advantage over those already grown, which produce timber suitable for the same purposes, either by better growth, earlier maturity, better disease-resisting qualities, more vigorous constitution, superior quality of timber and the like. Some apparently suitable species have been already condemned in certain quarters, for the reason that the wood produced by garden-grown trees has been coarser and inferior in quality to imported wood. This, however, can hardly be taken as a fair guide to the marketable value of any particular kind of timber, and it would be unwise either to extol or condemn a species simply on account of the quality of the timber produced by trees grown for ornamental purposes. Before commencing the culture under forest conditions of any tree about which little is known, a certain amount of preliminary experimental work is necessary, and even with certain well-tried trees, it is unwise to form extensive plantations in quite new localities without testing their possible behaviour beforehand. Take the Douglas fir in two midland counties as an example ; in Shropshire it grows well and is considered to be an important tree for future planting, whilst in certain parts of Derbyshire it has been tried time after time with most disappointing results. Another case in point where experiments with one of our commonest trees have proved it to be unsuitable for certain positions where it once formed the principle feature, is the planting of bog-land with Scots pine. Buried in the peat, roots and trunks of this pine are found, yet it will not grow in those places now owing to the altered conditions. Experiments, however, have proved that an American spruce, *Picea sitchensis*, is able to hold its own where the native tree has

failed. Other instances of discoveries of likely forest trees within recent years, from amongst the ranks of ornamental specimens, are the Japanese larch, which is found to grow more quickly and resist disease better than common larch, and Corsican pine, which for certain positions is an improvement on Scots pine.

Experiments in the past, however, have not gone far enough, and discoveries which have been made have been due largely to the fondness of certain individuals for a few kinds of trees. With experimental work of this sort it is very necessary that full records both of successes and failures should be reported, for as much information may often be obtained from one as from the other.

Within the last eight years an experimental forest has been formed at Avondale in Ireland. It is under the control of the Board of Agriculture for Ireland, and 106 acres, divided into 91 plots, have been planted with various kinds of trees. A description of the work carried on there is to be found in the "Quarterly Journal of Forestry," v., Jan. 1911, pp. 58–60. As yet it is too early to gain definite information as to how certain trees are likely to thrive, but North American conifers are said to be doing well while broad-leaved trees appear to require more sun. This makes it evident that more than one experimental area is necessary if trees are to be thoroughly tested. A certain amount of experimental planting might well be carried on by landowners giving up small woods or spinneys to single kinds of trees or to a mixture of several kinds, but to carry the work on in a systematic manner a more ambitious scheme is necessary, for it is only by having blocks of trees growing side by side, under similar conditions, that correct comparisons can be made. Neither ought the blocks to be very small, at least half-an-acre would be required for each experiment to do it justice, and it would be necessary, for the guidance of future generations, to preserve strict accounts of each experiment from the time of sowing the seeds onwards. Needless to say such an area would be of the greatest importance to intending planters, whilst once the necessary knowledge of the possibilities of a certain kind of tree for forest planting had been obtained by the evidence of its behaviour in a trial block, its success or otherwise, as an ornamental specimen, might well be taken as a guide to its suitability for any special locality.

In the following notes trees of commercial standing are dealt with which thrive satisfactorily as ornamental specimens in the British Isles. References as to the value of the timber for various purposes are taken from Hough's "American Woods"; "Timber," by J. R. Batterden; "Timber and Timber Trees," by Thomas Laslett; and "Timbers of Commerce," by Herbert Stone.

Descriptions of the American trees mentioned are to be found in the "Silva of North America," by Prof. C. S. Sargent, and references are taken from the "Trees of Great Britain and Ireland," by H. J. Elwes and A. Henry, and from other works with regard to the behaviour of various trees in this country. In some instances directions of culture, as recommended by the United States Department of Agriculture in various Forest Planting Leaflets for American trees, are given as a possible guide for intending planters.

I.—American Broad-leaved Trees.

The Tulip Tree (*Liriodendron Tulipifera*, L.).—This is one of the most important broad-leaved timber trees of North America, and a large amount of timber finds its way annually into the markets of the United Kingdom under the names of yellow poplar, white poplar, canary whitewood and white wood. The wood is described as being light, fine and straight-grained, easily worked and yields a good finish. Some qualities are white, others pale yellow and others marked with brown. It is in request for many of the uses to which the better classes of deal are put in the interior finish of houses, such as doors, panels, wainscoting and casing for electric-light wires, while it enters largely into the cabinet trade both as a foundation for veneer and for constructive purposes. A full description of the wood and its uses is given in Hough's "American Woods," i, pp. 40–42. The current price for the wood in London, according to Messrs. Churchill & Sim's Wood Circular for April 4th, is from 1*s.* 6*d.* to 1*s.* 9*d.* a cubic foot for logs.

The species has a wide distribution in N. America, for it occurs from southern Canada to N. Florida and S. Alabama. Average-sized trees would appear to be from 100 to 125 feet high, with a diameter of from 3 to 6 feet, the boles being clear of branches for two-thirds of their height. Under the most favourable conditions, however, when growing in the valleys of the Southern States, it is found from 160 to 190 feet high with a trunk up to 10 feet in diameter. J. N., writing in Woods and Forests" for 1884, p. 446, describes a tulip tree which he saw in Virginia as being 210 feet high, branchless for 100 feet, 42 feet in girth at 5 feet from the ground, with a branch spread of 150 feet. In the "Garden and Forest" for 1897, p. 458, a log exhibited at the Nashville Exhibition, by the Nashville Chattanooga and St. Louis Railroad Co., is mentioned which measured 42 feet in length, 10 feet 4 inches in diameter at the butt, and 7 feet at the small end. It was estimated to contain 1260 cubic feet of timber and was cut from a tree about 600 years old.

For purposes of comparison, trees grown under ornamental conditions in the British Isles, have been recorded from 80 to 107 feet in height, with girths ranging from 10 to 17 feet at 5 feet above the ground. These dimensions may be considered to compare with those of average-sized American trees. The largest specimens are met with from the north Midlands to the south of England, but good examples have been noted in Scotland. It is difficult to form an accurate idea of the age of the larger trees, but they probably range from 100 to 150 years. This would place the maturing age in England about on a level with that of beech.

A full account of the tulip tree and its behaviour in the British Isles, together with particulars of many large trees, is given in "Trees of Great Britain and Ireland," i., pp. 65–74. The largest tree mentioned, now dead, grew at Stowe, near Buckingham. Mr. Elwes found this tree to be 107 feet high with a clear bole of 30 feet and a girth of 13 feet at 5 feet from the base and 21 feet 4 inches near the ground. A tree growing at Leonardslee, the seat of Sir E. Loder, Bart., near Horsham, when measured in 1903, was 97 feet

high, with a clean straight trunk of from 25 to 30 feet. It was at that time considered to be about 90 years old. A fine tree nearly 100 feet high was noted at Margam in S. Wales a few years ago.

The best trees are found growing on well-drained, loamy soil, where plenty of moisture is obtainable, but good examples are to be met with on both clayey and very light soils. It does not thrive on wet, badly drained ground, neither is it a success in soil of a limy character. Specimens at Kew may be noted growing on both light and heavy land. The old specimen near the north end of the Rhododendron Dell is on sandy ground, whilst the position occupied by a tall tree in the Azalea Garden is marked by the soil being of a clayey nature.

A " Forest Planting Leaflet," Circular 93, on this tree, has been published by the United States Department of Agriculture. In it the tree and its requirements are fully described. For the benefit of possible planters the following notes have been extracted. Seeds are produced abundantly nearly every year, though only 5 to 10 per cent. are fertile. Those sown as soon as ripe germinate the following spring, but if the seeds are kept and sown in spring they have a tendency to lie in the ground a year before germinating. Seedlings should not remain in the nursery for more than two years, for after that time they are difficult to transplant successfully. The tree is intolerant of shade and prunes itself well with even moderate side shade. Seedlings can endure moderate shade, but more light is demanded as the trees grow older. At maturity they are usually taller than their associates and their crowns are fully exposed. Growth is rapid for 50 years, after which it gradually decreases. Spacing is recommended at 6 feet apart each way, and mixed planting is preferred to a pure stand. On rich land in sheltered valleys, it is used as the predominant feature of plantations, but in more exposed positions other species are planted in excess. Any shade-enduring hardwood with white pine and Norway spruce are recommended as companion trees. For planting in this country it is probable that Scots or Corsican pine and spruce would form good nurses. An account of the species and details of its distribution in America may be found in the Silva of North America, i., pp. 19–20.

The Black Walnut (*Juglans nigra*, L.).—There is reason to believe that this tree will be worth growing for its timber in certain parts of the British Isles, for it thrives in many localities and appears to be no more susceptible to late spring frosts than the common walnut. American-grown timber is imported in large quantities and is put to many purposes connected with the manufacture of the better classes of furniture. It is dark brown, or sometimes almost black, in colour, and may be obtained in wide boards or logs. The wood is often clean and straight-grained, though it may be finely figured. Burrs are produced, as in the common walnut, and these, and the best marked logs, command fancy prices for veneer. Elwes, in " Trees of Great Britain and Ireland " ii., p. 270, says that English-grown wood is quite equal to imported wood in colour, and when properly seasoned is as good as the best Circassian or Italian Walnut.

This favourable opinion appears to have been formed by a London timber merchant also, as long ago as 1883, for in a note in "Woods and Forests" for December 5th of that year, he recommends the tree to the attention of foresters as a suitable subject for forest planting. With regard to a tree growing at Syon, he gives the length of the trunk as 25 feet and its quarter girth as 24 inches, its market value being £25 or 5*s*. a cubic foot. At that time the tree was about 50 years old. He also refers to another black walnut as follows. "Singularly enough, I bought one as an elm out of a garden not 300 yards from my sawmill, so I am fortunately able to send you a specimen of the English-grown wood; it was about 15 feet long by 20 inches quarter girth, and had forty annual rings. You will note that the wood has obtained from our English soil the very character American wood is so deficient in, viz., hardness and weight, approaching in this respect the character of Italian walnut, or what is represented by the words 'good quality.' I am now making from this tree a sideboard which will, I think, be a beautiful specimen of woodwork." A section of Kew-grown timber on view in the Forestry Museum, shows that the wood is capable of taking a high polish. The price of imported wood in April of the present year varied from 2*s*. a cubic foot for inferior qualities to 5*s*. a cubic foot for the better samples. Boards realised somewhat higher prices.

Juglans nigra is a native of N. America, being found widely distributed from southern Ontario to the Southern United States. Details of its distribution and botanical characteristics are to be found in Sargent's "Silva of N. America," vii., pp. 121–124, while other information on these points, together with notes on the behaviour of the tree in this country, may be derived from "Trees of Great Britain and Ireland," ii., pp. 262–270. It is said to vary considerably in size, mature specimens being met with from 50 to 150 feet high, the girth varying from 6 to 20 feet. In England the largest trees vary from 80 to about 116 feet in height, with girths from 10 to 14 feet. Two of the largest trees known are in Marble Hill Park, Twickenham, and Syon House Park, Brentford. The former when measured by Mr. Henry was 98 feet high by 14 feet 3 inches in girth, and the latter as recorded in "Trees and Shrubs at Syon House," 1910, 116½ feet high by 13 feet 7 inches in girth.

The United States Department of Agriculture has issued a "Forest Planting Leaflet," Circular 88, on this tree, and it may be of interest to refer to a few of the principal points discussed therein. Its trunk is said to lengthen into a tall tapering column, often with no limbs for a distance of 50 or 60 feet. The usual height of mature forest-grown trees is given as from 70 to 90 feet with a diameter of from 30 to 45 inches, and 75 years is given as an average marketable age. It is intolerant of shade, matures with a thin head of branches and rarely prevents the growth of grass and weeds beneath. Though sometimes raised in nurseries and transplanted to permanent places when quite young, recommendations are made that seeds should be sown where the trees are to grow in order to avert the risk of transplanting. Intervals of 6 or 8 feet are advised to be left each way between the trees, the intervening spaces being planted with some shade-enduring species in order to suppress the side branches.

The cultivation of the black walnut in this country would probably need to be carried on below an elevation of 500 feet, the more sheltered positions being selected and preference given to land such as may be expected to grow good oak. Planted 7 feet apart with silver fir or hornbeam between should prove to be a suitable arrangement. Providing it is found possible to cultivate the species successfully under forest conditions, its timber ought to be more remunerative than that of oak, if present prices can be taken as a guide. Fertile nuts are produced freely by the older trees in this country. As an illustration of the rate of growth on light soil, a transverse section of a trunk measuring 2½ feet in diameter, grown at Kew, shows 95 annual rings.

The White Ash (*Fraxinus americana*, L.).—As seen under cultivation in England, even when growing as an isolated tree, the white ash rises with a clean, straight trunk to a considerable height, the branches being small and the head narrow. Compared with common ash, *F. excelsior*, L., growing under similar conditions at Kew, it is of more rapid growth and appears less susceptible to attacks by scale insects. Several moderately young, healthy examples may be noted in the vicinity of the Azalea Garden, one isolated tree being 66 feet high with a girth of 2 feet 9½ inches at 5 feet from the ground. It has gained 3 feet in height and 4½ inches in girth since measured by Mr. Elwes in 1907. Unfortunately its age is not known, but judging from its growth during the last 15 years it is probably about 40 years old. Two older specimens are to be seen on the south side of the mound near the Cumberland Gate. Both are upwards of 80 feet high and girth 8 feet 5½ inches and 8 feet respectively at 5 feet above the ground.

White ash timber may be used for all the purposes to which the wood of the common ash is put, whilst David Denning, in "The Art and Craft of Cabinet-making," 1891, says that "it is superior to English ash for furniture as it is usually of better colour." It is imported largely for numerous purposes. There is no reason to believe that it would command a better price than English ash, though it may be suitable to plant on account of its rapid and vigorous growth. Details of its distribution in N. America together with its botanical characteristics are to be found in Sargent's "Silva of N. America," vi., pp. 43–45, and additional information is given in the "Trees of Great Britain and Ireland," vol. iv., pp. 901–905. "Forest Planting Leaflet," Circular 84, United States Department of Agriculture, is devoted to this tree, and the following remarks bearing upon its habits and growth are extracted therefrom. Its average height is from 70 to 80 feet with a diameter of from 2 to 3 feet. Plantations are found to give the best results in protected valleys on sandy loam that is light and easily worked. It will thrive, however, in less favourable and even in adverse localities. A porous subsoil is essential, and a water table at a depth of 10 or 12 feet is of decided advantage. Mature trees can endure only a moderate amount of shade, while young seedlings will start in dense shade but require considerable light for their perfect development. Its economic uses are referred to as follows: "The wood of the white ash is of great economic value. Its most valuable qualities are strength and elasticity,

and these, combined with its ability to take a good polish and to season without injury, make it a timber of first rank for furniture, car and vehicle construction, interior woodwork, agricultural implements and tools."

American-grown seeds would need to be obtained for starting a plantation, and care should be taken to order from a firm able to supply the true tree and not one of its near allies. The percentage of fertile seeds is said to be low, hence the necessity for rather thick sowing. Young trees are planted in permanent positions in America when a year old. In some instances it is planted as a pure crop, allowing spaces of from 4 to 6 feet between the trees, and at other times it is planted as a mixed wood; black walnut, black cherry, hackberry, hardy catalpa, Scots pine and European larch being recommended for companion trees. It is probable that pure plantations in this country might be made at 3 or $3\frac{1}{2}$ feet apart with success, whilst a mixed plantation might contain hornbeam and Corsican pine. Anywhere where ordinary ash grows would suit the white ash, and it might also be planted on lighter soil than that usually allotted to *F. excelsior*.

The Black Cherry (*Prunus serotina*, Ehrh.). — According to reports from American sources the wood of this cherry occupies a similar position in America to that of the common cherry in England, for it is used for cabinet-making, decorative work in houses and various fancy articles. Being of a rich reddish-brown colour and finely grained, it may be manufactured with a handsome finish and it is capable of taking a high polish. As is the case with our native species, however, it has been used so extensively that the present supply is limited. Though there is no reason to believe that it would possess any distinct advantage over the British species, it is well worth a trial, especially as it will bear a moderate amount of shade and thus be able to act as a partner of the ground whereon some light-demanding subject is to be grown. American foresters recommend it for mixing with white ash, silver maple and black walnut. In a recently published book on timbers by J. R. Batterden, "Timber," 1908, the black cherry is referred to on page 98 as follows :—'The Black Cherry (*Prunus serotina*), a tree 50 to 80 feet high, is especially esteemed and can be obtained in wide boards; cherry mellows and grows richer in colour with age, the varieties with wavy textures are particularly beautiful; the timber is mostly used for cabinet work and furniture, turnery, walking sticks, &c."

Under forest conditions in America the black cherry is said to have a long, slender trunk surmounted by a comparatively small, open crown, composed of large, irregular branches. The trunk is often free from branches for a distance of 70 feet (Circular 94, U.S. Dept. of Agric.). In New England it is said to be of medium size, from 30 to 50 feet in height, with a diameter of from 15 to 24 inches. In the Middle States a height of 60 feet and a diameter of $2\frac{1}{2}$ feet is attained, but the best development is said to occur on moist residual soil of the upper slopes of the southern Alleghenies where a height of 90 feet and a diameter of 4 feet are not uncommon. In this country it will probably not attain more than average growth, although trees planted in poor, sandy soil

have grown to a fair size. The larger trees at Kew measure from 45 to 63 feet in height and are up to 4 feet 4 inches in girth. These are growing in poor, sandy soil. Under natural conditions this tree is found among beech, birch, oak, hickory, black walnut and maple. The above-mentioned circular says that "the black cherry will grow fairly well on dry situations, but it is only in the moist well-drained, rich soils of mild climates that the maximum development is reached. The tree thrives on bottom lands, yet makes a moderate growth on sandy or rocky upland if the soil is penetrable."

"The black cherry is well adapted for mixed planting throughout the Middle West. It serves a useful purpose as a nurse tree in forest plantations and where luxuriant foliage is desired. In general it is too short lived and of too limited economic value to be recommended for extensive planting."

Spacing is recommended at from 4 to 6 feet apart, one year old plants usually being transferred to permanent situations.

At the present moment the value of English cherry wood cannot be said to hold out any recommendation to planters. As with some other kinds of timber, however, the supply for some years past has been so small and so irregular that it has ceased to be looked on as a standard wood, and it is quite probable that were a good supply to be again obtainable prices would go up and it would be sought after. In an interesting article on *P. serotina*, which appeared in "Woods and Forests" for January 9th, 1884, p. 83, a table of prices in the Boston market of six of the principal American woods employed in cabinet-making is given as follows :—

	£	*s.*	*d.*	
Black Walnut	15	12	6	per 1,000 feet.
White Oak	13	10	10	„ „ „
Cherry	12	10	0	„ „ „
Butternut	10	8	4	„ „ „
White Ash	8	6	8	„ „ „
Sugar Maple	8	6	8	„ „ „

The Black Locust or False Acacia (*Robinia Pseudacacia*, L.).—Attempts were made a century or more ago to popularize this tree in England for commercial purposes, and again in 1823 its merits were strongly advocated. Loudon, "Arboretum et Fruticetum," i., gives a considerable amount of information on the subject, and states that about the latter period one man alone sold 1,000,000 trees for the purpose. Unfortunately no records appear to have been kept of these plantations, and apparently all the information that can be gleaned about them has to be extracted from short notes which were published from time to time in various periodicals, 40 to 60 years ago. This evidence is very conflicting, for A. P., Cheam, writing in the "Gardeners' Chronicle" for December 9th, 1843, p. 861, speaks highly of the tree and the durability of its timber. He had removed posts from the ground which had been in use for 20 years, which did not show a sign of decay. Two hundred trees planted by him in 1823 had made very good progress and contained a large percentage of heart-wood. On February 23rd, 1856, we find him

writing again in the same journal, p. 119, and strongly recommending the planting of the tree. He had been cutting from his plantation for several years and found the wood of good quality, whilst the posts referred to in his earlier note were still sound. Replying to A. P., Cheam, R. J. Selby does not consider the tree worth planting as it is very easily damaged by wind. Perhaps the best article on the subject is one by "Tassel" in the "Gardener's Chronicle" for April 14th, 1855, pp. 240–241. He discusses the tree from actual experience and advises cutting at an early age, 30 to 35 years. Planted with larch, Turkey oak and fir it grew faster than the latter two but was over-topped by the larch. He instances an isolated tree which had been planted in 1816; this in 1855 was 60 feet high, and girthed 7 feet 10 inches at the ground, 4 feet 4 inches at 10 feet high and 4 feet at 20 feet high.

The species is a native of the Eastern United States, where it grows to a height of from 60 to 80 feet with a trunk $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in diameter under favourable conditions, though in some places it is much smaller. Its rate of growth in Great Britain compares favourably with American records, while as regards size, it grows almost as large in England as in its native country. The yellowish coloured timber is hard and durable. In America it is used for shipbuilding, tree-nails, hubs for wheels, posts for fencing and various other purposes. In some continental countries the wood of young trees is in demand, both round and split, for vine props and older wood is used for spokes, &c. "Forest Service Circular," No. 64, United States Department of Agriculture, gives the life of a post made from the heart-wood as from 15 to 25 years.

It adapts itself to a variety of soils and conditions, for it flourishes on poor, light land and also in ground of a clayey character. Good specimens are notable both on low land and on hill sides where shelter from rough winds is provided. Suckers are produced freely, and for this reason it has been recommended for planting on loose banks to help to bind the soil. The timber ought apparently to be cut when the trees are between the ages of 35 and 55 years, for older trees often show signs of decay. The scarcity of the false acacia in our woods after being planted somewhat extensively, suggests that it is not suitable for forest planting. In the absence of any definite information on the subject, however, the usefulness of the timber makes it well worth a further trial.

Seeds are ripened freely and form a ready means of propagation. Growth during the early years is rapid, and one year old plants will probably be found to be quite large enough for permanent planting. The species has been found to succeed as a pure crop in America spaced 4 feet apart in the rows and 6 feet between the rows. It has also given good results when mixed with ash. It is one of the trees mentioned in the American "Forest Circular," No. 99, as a suitable subject for planting on the semi-arid plains of Kansas, Nebraska, Oklahoma, &c.

The Black or Cherry Birch (*Betula lenta*, L.).—This is one of several American birches which supply a large amount of timber each year both for home consumption and for export. Some idea of the importance of our imports of American birch-wood may be gathered from the statement made in J. R. Batterden's book

'Timber," p. 104, that 1,500,000 cubic feet were imported into the Mersey in 1906. This wood is received partly in the log, partly as boards, and sometimes worked ready for use. It is employed for a variety of purposes, the better qualities being used in the manufacture of furniture and for cabinet work, while bobbins, shuttles, shoe lasts and other articles are made from the remainder.

B. lenta is described in the "Silva of N. America" ix., pp. 50–52. It is stated to form a tree 70 to 78 feet high with a trunk 2 to 5 feet in diameter. The wood is reported to be heavy, very strong and hard, close-grained, with a satiny surface, susceptible of receiving a beautiful polish. A dark-brown or reddish heart-wood is contrasted with yellowish sap-wood. It is used largely for furniture and in some of the provinces on the Canadian sea-board for shipbuilding. Hough, "American Woods," ii., p. 35, reports very favourably on the wood, and says that it makes a good imitation of mahogany and cherry when polished.

The species is found in Canada and the N.E. United States, and is distinguished from other birches by its aromatic bark and leaves. The bark is of commercial importance in America, for it is collected during late summer and by processes of maceration and distillation furnishes an oil, known as "oil of sweet birch" and "oil of betula," which is used for flavouring purposes ("American Medicinal Barks," by Alice Henkel, Bulletin No. 10, U.S. Dept. of Agriculture). It is also said that beer is made from the sap of the tree.

Planting in this country appears to have been limited, for well-grown trees are rare. Representatives are to be found at Kew, but the older trees have hardly proved so satisfactory as some other American kinds. As the birches are usually fast growing trees a plantation would soon prove its worth. It would be well to try it on somewhat richer soil than that which is usually associated with the growth of birch.

The Yellow Birch (*B. lutea*, Michx.).—The distinguishing features of this species and *B. lenta* are less marked than is the case with other American birches, though the sweet bark of the cherry birch is a good character. Descriptions of both trees are to be found in the "Silva of N. America," vol. ix., and their botanical characteristics are also recorded in "Trees of Great Britain and Ireland," iv. It is found in the N.E. United States and Canada, the better developed trees being up to 80 feet high and 3 feet in diameter. Hough, "American Woods," i., pp. 64–65, refers to the timber as follows:—"Wood hard, close-grained, tough, heavy and very strong, compact, taking a beautiful satiny polish; heart-wood reddish-brown, sap-wood nearly white." Its uses are numerous, for in addition to being employed by wheelwrights and cabinet-makers, it enters largely into the manufacture of chair-bottoms, friction-pulleys and small wooden articles. Young saplings are split for hoops for casks, and burrs from old trees make good mallets and beetles. It would probably succeed best as a fairly dense, pure stand. Pine and spruce might, however, be tried with it to form a mixed wood.

The Paper or Canoe Birch (*Betula papyrifera*, Marsh.).—This is another of the American birches which appears to be worth a trial

in British woodlands, for it grows quite as well as the common birch and produces a good quality timber. Hough, ii., pp. 33–34, describes it as being a favourite timber for such small articles as clothes pins, spools, pill-boxes, shoe-lasts and pegs ; he also says that it is used for wood-pulp and for furniture. Its bark was formerly an object of considerable importance to the North American Indians, for in addition to fashioning their canoes from it, it furnished them with waterproof tent covering, baskets, and various other commodities. In Museum No. 1 at Kew an interesting series of articles manufactured from the bark of this tree may be seen.

The paper birch is found further north than any other deciduous American tree, and under favourable conditions grows to a height of 80 feet with a diameter of 3 feet. According to Bulletin 47, "Trees and Shrubs tested in Manitoba and the North-West Territories," published by the Department of Agriculture, Ottawa, Canada, it is about equal to *B. alba*, L. for hardiness and stands better than either *B. lenta* or *B. lutea*. It grows well at Kew in poor sandy soil. The largest specimen is 50 feet high with a girth of 4 feet at 5 feet from the ground. All the birches are suitable for close planting in pure stands, and they may also be mixed with spruce or pine. (For full particulars of this tree and its uses *see* "Paper Birch in the North-east," Forest Service Circular, 163, U.S. Dept. of Agric.).

The River or Red Birch (*Betula nigra*, L.).—Though of less importance than the birches already referred to, this species grows freely enough to warrant a trial under forest conditions. Hough describes it as a tree 80 feet high by 2½ feet in diameter, extending from Massachusetts southwards to Florida and westwards to Iowa, Kansas and Texas. Its wood is said to be "rather hard, strong, close-grained, compact, with fine medullary rays, yielding a smooth finish ; used in turnery, woodenware, shoe-lasts, &c." Under natural conditions it is found inhabiting moist land, such as banks of streams and marshy places. That it grows fairly well on dry ground, however, is shown by several good specimens which are growing in the natural sand at Kew. One of the best, standing near the Victoria Gate, is 55 feet high and 4 feet 10 inches in girth at 5 feet above the ground. *B. nigra* may be distinguished amongst other birches by its rough, reddish-brown bark.

The Oregon Maple (*Acer macrophyllum*, Pursh.).—This is one of the most important of several American Maples which are likely to prove useful for British woodlands, for it grows quickly, forms a large tree and its timber is of good quality. Although introduced a century ago it is not common, but some good examples have been noticed in a few places. In the "Silva of N. America," ii., pp. 89–90, it is described as forming a tree up to 130 feet high with a girth of 15 feet. It is found along the Pacific Coast, below 2000 feet elevation from Alaska to S. California, and appears to reach its maximum dimensions in the moist climate of Vancouver Island and the adjacent mainland. The timber is said to be of good quality, light, soft, close-grained and capable of receiving a beautiful polish. In "Trees of Great Britain and Ireland," iii.,

p. 683, the wood is said to be equal in beauty and similar in character to that of other eastern maples, and is more valued than any other native hardwood in British Columbia and Washington. The largest tree known to Mr. Elwes in this country is growing at Boynton, in Yorkshire. When measured a few years ago it was 70 feet high and 6 feet in girth, and had been planted about 60 years.

This species may be distinguished from others by means of its large sycamore-like leaves, which are sometimes 9 inches across, and by its hairy fruits. The pendulous racemes of fruits are sometimes very conspicuous, for they are from 6 to 9 inches long, and the wings are frequently red in colour. Fertile seeds are borne on trees at Kew. *A. macrophyllum* is likely to thrive under similar conditions to the common sycamore, and as its wood is apparently quite equal in quality, there would appear to be no reason to doubt of its proving a commercial success, providing it thrives satisfactorily under forest conditions. It could be grown as a pure wood or as a mixture with beech or silver fir for a companion. Planting might be done at 4 feet apart.

XXVI.—FUNGI EXOTICI: XII.

(With Plate.)

G. Massee.

Eleven new fungi are here described from material sent to the Royal Botanic Gardens from the Malay Peninsula, Tropical Africa, Natal and Queensland. Of those described the *Puccinia* appears to be the most serious as it is a destructive disease of the Lemon grass at Entebbe, Uganda.

Agaricaceae.

Clitocybe egregia, *Massee.*

Pileus carnosus, convexo-umbilicatus, siccus, pallido-ochraceus, centro obscuriore, fibrillis fuscis centro praesertim virgatus, margine lobato primitusque involuto, 25–30 cm. latus. *Lamellae* decurrentes, subdistantes, perangustae, crassiusculae, subfurcatae, acie integra, albidae, aetate brunneo-tinctae. *Stipes* cylindricus, apice basique subincrassatus, farctus, glaber, albido-griseus, 25–35 cm. longus, 3–4 cm. crassus, basi fusiformi-radicatus. *Sporae* ellipticae, hyalinae, $8 \times 5\ \mu$. *Caro* firma, pallida.

Singapore. On the ground, *Ridley*, 89.

The genus *Clitocybe* includes some of the largest known agarics, but the present species far exceeds in size those previously described. *C. egregia* is most nearly allied to *C. maxima*, the latter being distinguished by the deeply infundibuliform, glabrous pileus, much shorter stem, paler colour and smaller spores.

Ustilaginaceae.

Ustilago trichopterygis, *Massee.* (Figs. 15–17.)

Sori olivaceo-atri, compacti, dein pulverulenti, ovarium implectentes. *Sporae* ellipsoideae vel globosae, episporio levissimo, fuligineo-olivaceae, 4·5 × 3·5μ vel 3·5—4·5μ diametro.

Tropical Africa. N. Nigeria: Lokoja, in ovaries of *Trichopteryx hordeiformis*, Stapf. *J. M. Dalziel*, 276.

Resembling *Ustilago olivacea*, Tul., in habit and in general appearance, but distinguished by the much smaller, smooth spores.

Ustilago virens, *Cooke.*

Sumatra. Indragiri: on rice, *Ridley*, 11,252. Coll. *C. Curtis.*

Ustilago polytriadis, *Massee.*

Sori ovaria tantum implectentes ac ea globose turgentes, friabiles, cito pulverulenti, aterrimi. *Sporae* globosae vel mutua pressione obtuse angulatae, 15–16μ diam., atro-fuligineae, opacae, leves vel vix subrugulosae.

Malay Peninsula. Malacca: in the ovaries of *Polytrias praemorsa*, Hack.

Resembling *Ustilago australis*, Cooke, in general appearance, and habit, but differing in the larger and darker coloured spores.

Ustilago vastatoria, *Massee.*

Sori bases pedunculorum folia vaginasque nondum evolutas infestantes, eaque saepe majuscule distendentes, primo epidermide tenui tecti, dein nudi ac pulverulenti, fusco-atri. *Sporae* subglobosae, intense subopace fuligineae, episporio minutissime denseque papilloso, 15–17μ diam.

Tropical Africa. Baghirmi, N., between Massema and Abongher, on *Panicum* sp., *Chevalier*, 9638.

Somewhat resembling *Ustilago hypodytes*, Fr., in habit, but distinguished by the much larger spores.

Uredinaceae.

Puccinia cymbopogonis, *Massee.*

Maculae epiphyllae, rubescentes vel fulvescentes, indeterminatae. *Acervuli* hypophylli, minuti, lineares, erumpentes, superficiales, pulverulenti, saepius densissime gregarii et totum folium occupantes, cinnamomei. *Uredosporae* sphaeroideae vel ovatae, episporio incrassato minutissime striatulo intense cinnamomeo, 20–23μ diametro. *Teleutosporae* ovatae, medio constricto-1-septatae, episporio tenui apice valde incrassato brunneo, 30–36 × 20–22μ, pedicello hyalino apice fuscescente suffultae.

Tropical Africa. Uganda: Entebbe, on *Cymbopogon citratus*, Stapf. *R. Fyffe.*

This appears to be a very destructive parasite. The Lemon grass was taken from a plot in the Botanic Gardens, Entebbe, and practically every leaf was destroyed.

Puccinia pulvinata, *Massee.*

Maculae nullae. *Acervuli* hypophylli vel amphigeni, concentrice vel areolatim in centro densius dispositi, pulvinato-prominuli, compacti, intense cinnamomei dein grisei et subpulverulenti,

0·5 mm. diametro. *Teleutosporae* late ellipsoideae, subinde subglobosae, medio subconstricto-1-septatae, episporio tenui apice incrassatulo, pallide melleae, 50 × 35μ, pedicello longiusculo hyalino vel pallidissime fuscescente suffultae.

NATAL. Tabamhlope, 1520 m., on leaves of *Osyridocarpus natalensis*, DC. *Wood*, 10,527.

This fungus occurred on the leaves of the specimen bearing *Aecidium osyridocarpi*, Mass., but there is no evidence to show that the two are forms of the life-cycle of one species.

The spores of the *Puccinia* germinate in situ, the numerous germ-tubes giving a hoary and slightly pulverulent appearance to the acervuli or sori. The secondary spores are broadly elliptical and measure 12–14 × 9μ.

Aecidium osyridocarpi, *Massee*. (Figs. 11–14.)

Pseudoperidia densissime gregaria, late ramulis foliisque distortis ac contorto-gyrosis insidentia, erumpentia, cylindracea, ore lacero-fimbriato albido, contextu cellulis elongato-hexagonis crasse tunicatis. *Sporae* globosae vel e mutua pressione angulosae, episporio tenui minutissime verruculoso hyalino protoplasmate aureo-flavescente repletae, 18–20μ diam.

NATAL. Tabamhlope, 1520 m., on branches and leaves of *Osyridocarpus natalensis*, DC. *Wood*, 10,527.

Pseudoperidia densely crowded, causing much contortion of the shoots and leaves attacked, and in this respect closely resembling *Aecidium ornamentale*, Kalchbr., met with on *Acacia horrida*, Willd., at the Cape.

SPHAERIACEAE.

Balansia sessilis, *Massee*. (Figs. 8–10.)

Stromata sessilia, globulosa, subtus plus minus angustata, dura, extus atra ac minutissime punctulata, intus albida, 1·5–2·5 mm. diam. *Perithecia* in stromatis capitulis peripherica, densissime constipata, oblongo-ovata. *Asci* cylindracei, tunica ad apicem rotundata valde incrassata, 200–220 × 10–12μ, basi leniter attenuati, aparaphysati. *Spores* filiformes, paene longitudine ascorum, hyalinae, multiguttulatae dein multiseptatae.

MALAY PENINSULA. Johor: Batu Pahat, on the inflorescence of a species of *Ichnanthus*. *Ridley*, 10,988.

Most closely allied to *Balansia trinitensis*, Cooke and Massee; differing in the absence of a concave *Ephelis*, or conidial condition, in the sessile stromata, and in the longer asci and spores. The inflorescence is evidently attacked by the fungus while yet enclosed in the sheath, as the branches of the normally much branched and widely spreading inflorescence, are all bound together by a general stroma, and the inflorescence emerges as a simple spike. All the species are parasitic on grasses. The genus has a wide geographical range, extending from S. America, through Africa, to New Pomerania.

Balansia asperata, *Massee*. (Figs. 1–7).

Stromata stipitata, hemisphaerica vel subglobosa, infra umbilicata, asperata, extus atra, 1 mm. diam. *Stipes* cylindricus, lignoso-carnosulus, duriusculus, extus ater, sub lente minuteque squamulosus, circa 2 mm. longus. *Perithecia* in stromatis capitulis

peripherica, densissime constipata. *Asci* cylindracei, 100–120 × 7–8μ, basi attenuati. *Sporae* filiformes, longitudine ascorum, hyalinae, multiseptatae.

Malay Peninsula. Johor: Mount Austin, on the inflorescence of *Ichnanthus pallens*, Munro. *Ridley*, 12,508.

In this species the ovary of the host is converted into a black sclerotium, which produces a single, stipitate, ascigerous stroma. Allied to *Balansia Jungueri*, P. Henn., but much smaller in every part.

Gibbera tinctoria, *Massee.*

Perithecia epiphylla, densissime aggregato-constipata, crustam atram superficiem foliorum obtegentem efficicientia, globosa, purpureo-atra, rugulosa, ostiolo papillulato donata, 0·5 mm. diam., contextu minutissime parenchymatico sordide purpureo. *Asci* cylindraceo-clavati, apice crassiuscule tunicati, basi attenuato-pedicellati, 80 × 7–8μ. *Sporae* oblique distichae, ellipsoideae, utrinque rotundato-truncatae, 1-septatae, dilutissime flavae, 11–12 × 5–6μ.

Tropical Africa. Rhodesia: on leaves of *Monotes glaber*, Sprague. *Allen*, 734.

This species was first detected by my colleague, Mr. T. A. Sprague, B.Sc., on phanerogamic material sent to Kew for determination. Differs from *Gibbera Vaccinii*, Fr., in the much smaller, and relatively narrower spores, and in the dingy purple colour of the tissue of the perithecium. When treated with a dilute solution of potassic hydrate a brilliant purple colouring matter is liberated.

Hyphomycetes.

Hainesia aurantiaca, *Massee.*

Acervuli subcutanei, sparsi, vix pulvinati, parvuli, 0·5–1 mm. diametro, saepe confluentes, laete aurantiaci, dein pallescentes. *Sporulae* ellipticae, utrinque latissime rotundatae, hyalinae, saepe curvulae, 10–12 × 3–3·5μ, in sterigmatibus e strato prolifero fusco exsurgentibus filiformes, hyalinae, solitariae, acrogenae.

Queensland. On the pericarp of *Endiandra insignis*, Bailey.

Distinguished from its nearest ally, *Hainesia rhoina*, Ell. and Sacc., by its clear orange colour and somewhat larger sporules.

Explanation of Figures.

Figs. 1–7. — *Balansia asperata.*
Figs. 8–10. — *Balansia sessilis.*
Figs. 11–14.—*Aecidium osyridocarpi.*
Figs. 15–17.—*Ustilago trichopterygis.*

XXVII.—THE RAISED TURF SYSTEM OF PLANTING BOG-LAND.

(With Plates.)

W. Dallimore.

The successful planting of wet, boggy land is one of the most difficult problems the forester has to deal with, and when such conditions prevail at a high elevation and an unsatisfactory climate has also to be considered, the planter finds full scope for his abilities.

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In the past the great difficulty has been the proper draining and aerating of the ground at such a cost as would bring the work within the limits of practical commercial forestry, for, although in many cases proper draining would have been quite practicable, the cost was prohibitive. On the other hand, the opening of surface drains 15 to 20 feet apart, which could be done at a small cost, had little effect in districts where the rainfall was heavy, consequently the ground never became suitable for tree growth. A certain amount of success has attended ridging, especially where the ground has not been very wet to begin with, but this method of planting is not applicable to all circumstances.

For some years past a system of planting bog-land has obtained in Belgium which, though really an old system revived, has come to be known as the "Belgian system" or "raised turf system" of planting. This consists of opening drains 6 or 8 feet apart and 12 to 18 inches deep. The turves obtained during the process are laid face downwards at distances of 3 or 4 feet apart, the distance being regulated by the spacing of the trees. The turves are allowed to dry for several months, sometimes a year, during which time they become well aired and sweet. At planting time—April or May are considered the best months for the work—a circular hole is made in each turf. The soil removed is mixed with a handful or two of sharp sand and sometimes with a little basic slag, and placed around the roots of the young tree as it is being planted. Trees from two to three years old are found to be most satisfactory for the purpose.

About 1906 or 1907 this method of planting claimed the attention of Sir John Stirling Maxwell, Bart., one of the greatest enthusiasts in forestry matters in Scotland, who for 10 years or so had been experimenting with the planting of bog-land on his Inverness-shire estate at Fersit and Corrour, at altitudes varying between 800 and 1400 feet. At the higher elevations and under the worst conditions his experiments had met with little success, and he was convinced that the usually adopted measures could end in nothing but failure. Seeing that the "Belgian system" had much in its favour he decided to give it a good trial and described the method of culture in the "Transactions of the Royal Scottish Arboricultural Society," vol. xx, pp. 1–7. After a trial of three years the results were circulated through the medium of the same publication in 1910, vol. xxiii, pp. 153–157. The results as published there give overwhelming evidence of the superiority of this method of culture over those already tried, while details of cost show that it is well within the bounds of practical forestry. A description of the experiments from notes made during a visit to the experimental area last June may also be found in the *Kew Bulletin*, 1910, pp. 242–243.

The kindness of Sir John Stirling Maxwell in presenting specimens of young trees grown under both old and new systems of culture, for the Forestry Museum at Kew, has been the means of obtaining the accompanying photographs. The following explanatory remarks about the plants figured have been furnished by Mr. D. Grant, forester to Sir John at Fersit :—

"No. 1. Sitka spruce raised in Pollok seed beds, and lined one year in Fersit nursery. Planted on turf (Belgian system) age

two year (in seed bed), one year (transplanted), in April, 1909. Two handsful of gravel used to each plant. No manure used.

"No. 2. Sitka spruce raised in Pollok seed beds, lined one year in Fersit nursery, and notched on natural surface, April, 1909.

"No. 3. Sitka spruce (German) two year, one year, planted straight out on turf, April, 1909, with two handsful of gravel to each plant. No manure used.

"No. 4. Sitka spruce (German) two year, one year, notched straight out on natural surface, April, 1909.

"No. 5. *Pinus montana* var. *uncinata*, raised in Pollok seed beds, lined one year in Fersit nursery, planted on turf, age two year, one year, April, 1910, two handsful of gravel used to each plant. No manure used.

"No. 6. *Pinus montana* var. *uncinata*, same as No. 5. Notched in natural surface, April, 1910."

The leading shoots of three plants of number one, representing last year's height growth, were 14, 11½ and 11½ inches respectively, while last year shoots of number two measured 2, 2 and 2½ inches. The difference in colour was also very marked, for, while the leaves of the first three were of a dark, healthy green, those of the second three were yellow and undersized. Numbers three and four exhibited similar differences, but the turf-grown plants had made less vigorous growth than those raised from seeds sown in Scotland. In the case of number five the shoots were strong, the buds healthy, and the foliage full sized, plants of number six being small, weak and yellowish, with undersized leaves. In each instance the root system of the turf-grown examples was greatly in excess of that of plants grown in the natural bog.

The great advantage gained by this mode of culture is in producing a mass of sweet, well drained soil, which will supply the needs of a young plant for a couple of years or so whilst the natural peat below is gradually drying and sweetening, processes which are made possible by the closeness of the drains. When the food material in a raised turf is exhausted the roots are able to penetrate into that which is below. Sitka spruce is very popular for this kind of planting, whilst oriental spruce, common spruce, white spruce and *Pinus montana* var. *uncinata* are also planted. Scots pine has been tried but has been discarded from the wetter land. The area under cultivation at Corrour and Fersit is of considerable extent, and as the land lies in a cold and bleak position the experiments which are being carried on there will be watched with great interest during the next few years, for if the present system of planting turns out to be as successful as it promises to be at the present time, a great deal of land may be covered with trees which in the past has been considered to be quite out of the question. Several years must, however, elapse, especially where high ground is concerned, before a definite opinion can be formed of the results of the venture. Sir John has kindly presented two large photographs illustrating this method of planting, which have been placed on exhibition in the Forestry Museum.

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XXVIII.—DIAGNOSES AFRICANAE: XLII.

1261. **Heteromorpha scandens**, *J. J. Clark* [Umbelliferae]; affinis *H. arborescenti*, Cham. et Schlecht., sed caule scandente, foliis biternatis et margine crenato-dentatis, calycis dentibus nullis, fructu immaturo leviter alato differt.

Herba scandens, glabra, ramis tenuibus interdum tortis leviter multi-costatis. *Folia* alterna, biternata, petiolis 2·5–5·5 cm. longis, petiolulis primi ordinis 1·4–2·2 cm. longis, secundi ordinis 2–4 mm. longis; foliola membranacea, ovata, breviter acuminata, basi rotundata, margine crenato-dentata dentibus setuloso-mucronatis, 2·2–4·2 cm. longa, 1·3–2·2 cm. lata, nervis lateralibus 5–9. *Umbellae* compositae, terminales et axillares; involucri bracteae oblongae, ciliolatae, apice rotundatae, ∞, circa 5 mm. longae; involucellorum similes sed minores et non ciliolatae; pedunculi 2–3·5 longi, pedicelli 8 mm. longi. *Calycis* dentes 0. *Petala* ovata, integra, apice inflexa. *Discus* margine undulato cum stylopodiis conicis confluens. *Antherae* versatiles, flavae, 0·4 mm. longae; filamenta tenuia, 1·5 cm. longa; styli demum reflexi, brevissimi. *Fructus* immaturus oblongus, laevis, a latere compressus, semimaturus leviter alatus, plerumque uno mericarpio inhibito, altero plus minusve falcato, jugis primariis prominentibus, vittis ad valleculas solitariis 6.

Tropical Africa. British East Africa: Aberdare mountains, 2286 m., *Battiscombe*, 278.

1262. **Acalypha Allenii**, *Hutchinson* [Euphorbiaceae-Crotoneae]; affinis *A. ornatae*, Hochst., sed foliis ovato-vel oblongo-lanceolatis, caulibus pilis glandulis numerosis ornatis differt.

Planta herbacea, parva; caules circiter 30 cm. longi, profunde sulcati, glandulis stipitatis numerosis obtecti. *Folia* ovato-lanceolata vel oblongo-lanceolata, apice mucronata, basi cordata, 4–9 cm. longa, 1·2–4·5 cm. lata, repando-dentata vel denticulata, paullo rigide chartacea, utrinque setosa, nervis lateralibus utrinque 6–8 inferioribus ascendentibus superioribus arcuatis utrinque prominentibus, nervis tertiariis parallelis crebris subtus distinctis; petioli 0·5–1·2 cm. longi, glanduloso-pubescentes; stipulae lineari-subulatae, 6 mm. longae, parce pilosae. *Flores* monoici. *Racemi* ♂ axillares, solitarii, circiter 6 cm. longi; axis parce glanduloso-pubescens; bracteae conspicuae, lineares, 3 mm. longae, stipitato-glanduligerae. *Spicae* ♀ terminales, 5–7·5 cm. longae; bracteae ad 1·2 cm. longae, multidentatae, breviter acuminatae, dentibus glandulis stipitatis ornatis. *Sepala* 3, ovata, glanduloso-ciliata. *Ovarium* profunde trilobum, pilosum, eglandulosum; styli laciniati vel pectinati, dorso pilosi. *Capsula* non visa.

Tropical Africa. Rhodesia: Gwaai forest, *Allen*, 238; Leshumo Valley, *Holub*. Wankie Line, 80 miles north of Bulawayo, on sandstone, *Eyles*, 1130; 'South African gold-fields,' *Baines*.

1263. **Acalypha glomerata**, *Hutchinson* [Euphorbiaceae - Crotoneae]; *A. crenatae*, Hochst., similis, inflorescentiis ad apices ramorum confertis, bracteis ♀ glandulis stipitatis numerosis ornatis differt.

Herba gracilis, erecta, ramosa; caulis basim versus interdum lignosus, subteres, sulcatus, pilis brevibus pubescens, stipitato-glanduligera. *Folia* ovato-elliptica vel rhomboideo-elliptica, apice obtusa vel subacuta, basi cuneata, 2·5–6·5 cm. longa, 0·5–4 cm. lata, crenata, membranacea, utrinque setuloso-pubescentia, e basi 5-nervia, nervis lateralibus utrinque 3–4 prominentibus, nervis tertiariis laxis plus minusve parallelis subtus distinctis; petioli foliis aequilongi vel longiores, pubescentes; stipulae subulatae, parvae, pilosae. *Flores* monoici. *Inflorescentiae* ad ramorum apices glomeratae. *Bracteae* ♀ glomeratae, foliaceae, suborbiculares vel fere reniformes, circiter 3 mm. longae et 4 mm. latae, 8–10-dentatae, dentibus triangularibus intra marginem pilis longis apice glandulis ornatis, extus pubescentes, intus fere glabrae. *Sepala* 3, ovato-lanceolata, acuta, ciliata. *Ovarium* trilobatum, superne setoso-pubescens pilis glanduligeris intermixtis; styli gracillimi, paullo breves, fere basi divisi. *Semina* ovoideo-ellipsoidea, minute punctata, vix 2 mm. longa. *A. crenata*, var. *glandulosa*, Muell.-Arg. in Linnaea xxxiv. 42, et in DC. Prodr. xv. 871; *A. fimbriata*, Baill. Adansonia i. 272, partim, non Schumach. nec Hochst. (ex Müller).

Tropical Africa. Bongo: Addai, *Schweinfurth*, 2522; Gir, *Schweinfurth*, 2609. Uganda: Muka, *Kaessner*, 929. Galunka, *Kaessner*, 791; without precise locality, *Stuhlmann*, 1251, 1258. Zanzibar, *Schlechter*; *Stuhlmann*, 421, 423. German East Africa: Usaramo, *Stuhlmann*, 6599, 7005, 8674; Mrogoro, *Stuhlmann*, 8285; Marangu, *Volkens*, 2316; Dar-es-Salam, *Stuhlmann*, 7007, 7410, 7415, 7824, 7562; Tanga, *Holst*, 2022; *Volkens*, 166; Amboni, *Holst*, 2746. Portuguese East Africa: Mozambique, *Kuntze*.

1264. **Acalypha Grantii**, *Baker et Hutchinson* [Euphorbiaceae-Crotoneae]; affinis *A. ornatae*, Hochst. ex A. Rich., foliis glabris et floribus dioicis differt.

Frutex circiter 2 m. altus; rami juniores brevissime pubescentes, demum glabri. *Folia* ovata, apice sensim vel caudato-acuminata, acumine integro, basi rotundata vel subcordata, 5–6·5 cm. longa, 2–4·5 cm. lata, obtuse serrata, subchartacea vel fere membranacea, utrinque glabra, basi digitatim 5-nervia, nervis lateralibus utrinque 4–5 subtus prominentibus; petioli graciles, 1·3–3 cm. longi, supra in sulcis pubescentes, caeterum glabri; stipulae lineares, mox deciduae. *Flores* dioici?, ♂ non visi. *Spicae* ♀ terminales, circiter 2 cm. longae. *Bracteae* parvae, acuminatae, minute dentatae, dentibus glandulis terminatis, extus pubescentes. *Sepala* 3, ovata, superne ciliata. *Ovarium* superne pilosum, eglandulosum; styli 3, crassi, purpurei, profunde laciniati, glabri. *Capsula* et *semina* non visa.

Tropical Africa. Bongo: Sabbi, *Schweinfurth*, 2201. Uganda: Madi, *Speke* and *Grant*.

Both specimens are young and somewhat imperfect, and it is therefore uncertain whether the flowers are really dioecious.

1265. **Acalypha paucifolia**, *Baker et Hutchinson* [Euphorbiaceae-Crotoneae]; affinis *A. villicauli*, Hochst., sed bracteis florum ♀ acuminatis, foliis linearibus vel lineari-lanceolatis differt.

Caules probabiliter e rhizomate orti, graciles, usque ad 17 cm. longi, compressi vel sulcati, juniores longe setosi et breviter pubescentes, demum glabri. *Folia* lanceolata vel lineari-lanceolata, apice subacuta, basi rotundata, 2·5–5·5 cm. longa, 4–10 mm. lata, paullo repando-dentata, tenuiter chartacea, utrinque glabra costa et nervis lateralibus setosis exceptis, nervis lateralibus utrinque 10 arcuatis subtus distinctis, venis laxis; petioli 8–12 mm. longi, saepius setosi vel puberuli; stipulae lineari-subulatae, 4–7 mm. longae, fere glabrae. *Flores* monoici. *Inflorescentiae* ♂ solitariae, axillares, pedunculatae, 4–8 cm. longae; axis sulcatus, pubescens. *Gemmae* ♂ glabrae. *Spicae* ♀ terminales, 2·5–4 cm. longae; bracteae parvae, late ovatae, caudato-acuminatae, circiter 10-dentatae, dentibus dense stipitato-glandulosis. *Sepala* 3, lanceolata, ciliata. *Ovarium* parvum, parce pubescens, glandulosum; styli crassi, 4–5 mm. longi, laciniati, glabri. *Capsule* et *semina* non visa.

Tropical Africa. Portuguese East Africa: near Lake Nyasa, *W. P. Johnson*, 457.

1266. **Acalypha subsessilis**, *Hutchinson* [Euphorbiaceae - Crotoneae]; affinis *A. neptunicae*, Muell.-Arg., foliis subsessilibus, inflorescentiis brevioribus, bracteis ♀ minoribus inconspicuis differt.

Frutex; rami subteretes, cortice glabro paullo rugoso; ramuli juniores puberuli. *Folia* subsessilia, oblanceolata vel obovata, basi cuneata, apice obtuse acuminata, acumine interdum emarginato, 4–9 cm. longa, 2–5 cm. lata, chartacea, obtuse serrata, utrinque glabra, nervis lateralibus utrinque 6–7 intra marginem anastomosantibus subtus valde prominentibus, nervis tertiariis laxis subparallelis subtus conspicuis; stipulae lineari-lanceolatae, dorso carinatae, squamiformes, leviter pubescentes vel glabrae, 5 mm. longae. *Flores* monoici. *Inflorescentiae* 2·5 cm. longae, basi floribus foeminis 1 vel 2, superne floribus masculis numerosis; axis dense pubescens. *Gemmae* ♂ leviter pubescentes vel fere glabrae. *Bracteae* ♀ parvae et inconspicuae. *Sepala* 3, ciliata. *Ovarium* setosum; styli laciniati. *Capsula* et *semina* non visa.—*Mallotus brevipes*, Pax ex Engl. Pfl. Ost-Afr. vol. A. p. 18, nomen (non *Acalypha brevipes*, Muell.-Arg.).

Tropical Africa. British East Africa: Mazeras, *Powell*, 3 (partim). German East Africa: Usambara; Maschena, *Holst*, 3568. Tanga, *Volkens*, 185.

Var. **mollis**, *Hutchinson*; a typo ramis et foliis subtus molliter et dense pubescentibus differt.

Tropical Africa. British East Africa: Mazeras, *Powell*, 3 (partim); Zanzibar, *Kirk*.

1267. **Cyrtogonone**, *Prain*, gen. nov. [Euphorbiaceae-Crotoneae] genus inter Chrozophoreas prope *Sumbaviam* forsan melius ponendum; a *Crotonogyne* Chrozophorearum, quacum adhuc ob indumentum lepidotum consociatum, floribus paniculatis staminum indole petalisque liberis aliquanto distat.

Flores dioici, dichlamydei. ♂ *Calyx* in alabastro globosus, clausus, per anthesin irregulariter 2–3-valvus. *Petala* 5, raro 6, contorto-imbricata, libera. *Stamina* numerosa receptaculo parum convexo affixa; filamenta libera glandulis receptacularibus totidem consociata, summo apice inflexa, antheris fere triplo longiora, glabra;

antherae jam in alabastro erectae, dorsifixae, locelli paralleli connectivo latiusculo adnati, introrsim spectantes, longitudinaliter dehiscentes. *Glandulae receptaculares* antheras sessiles cassas simulantes dorso prope basin carinatae, antice supra medium stellato-hirsutae, apice minutissime emarginatae. *Ovarii rudimentum* 0. *Flores feminei* ignoti.—*Arbor* mediocris. *Folia* subtus densissime lepidota, alterna, ampla, penninervia, petiolo elongato, limbo basi 2-glanduloso ; stipulae minutae. *Flores* cymosi ; cymae in paniculam amplam terminalem dispositae ; bracteae minutae. *Inflorescentia* tota dense lepidota.

C. argentea, *Prain* (species unica).

Arbor dioica 8–12 m. alta, ramulis densissime lepidotis. *Folia* longa petiolota, coriacea, elliptica vel obovato-oblonga, abrupte acuminata, basi late cuneata vel rotundata, margine integra vel casu apicem versus denticulata vel minute acute lobulata, 15–25 cm. longa, 7–13 cm. lata; supra glabra, opaca, atrorividia ad basin ipsam distincte 2-glandulosa ; subtus densissime lepidota, argentea, nitidula ; petiolus 6–10 cm. longus, dense lepidotus apice basique simul incrassatus ; stipulae minutae, lepidotae. *Panicula* ubique lepidota, 25–30 cm. usque longa, basi 10 cm. diametro ; rhachis ramulos 15–20, inter se 0·5–1·5 cm. remotos 3–7 cm. longos emittens ; ramuli cymas 3–7 suffulcientes ; cymae 3–7-florae pedunculis 3–5 mm. longis ; bracteae ovatae, lanceolatae, 1–1·5 mm. longae ; pedicelli 4–5 cm. longi. *Calyx* in alabastro globosus, 6–8 mm. latus, clausus dein 2–3-fissus, densissime lepidotus. *Petala* 5, raro 6, contorto-imbricata, primum omnino extra, ultimum omnino intus, orbicularia, glabra, albida. *Stamina* 27–30 ; filamenta glabra, libera, 3 mm. longa ; antherae 1 mm. longae locellis connectivo latiusculo affixis, introrsim spectantes ; glandulae receptaculi omnes juxtastaminales. *Ovarii rudimentum* 0.—*Crotonogyne argentea*, Pax in Engl. Bot. Jahrb. xxxiii, 283.

Tropical Africa. Upper Guinea : Cameroons ; Bipindi district, Mimfia, *Zenker* 2029, 2359, 3078, 3668.

Dr. Pax has already fully explained the difficulties involved in referring this plant to the genus *Crotonogyne*, with which it agrees in having lepidote scales and two glands on the upper surface of the leaf at the junction of blade and petiole, but from which it differs in having a terminal not lateral inflorescence, in having free in place of united male petals, and in having inter-staminal receptacular glands as well as an extra-staminal ring, alternate with the filaments of the outer series. In general facies the plant now described much resembles *Sumbavia macrophylla*, Muell.-Arg., but differs in having the leaves with a pair of basal glands and not at all peltate at the base, in having lepidote scales in place of stellate hairs, in having relatively larger petals, much stouter filaments, introrse in place of lateral anther-cells, and in having glands on the receptacle. The receptacle in *Sumbavia* is densely pubescent, but has no glands.

1268. **Macaranga Dawei**, *Prain* [Euphorbiaceae-Crotoneae] ; species nulli africanae arcte affinis, filamentis basi connatis apice irregulariter et quasi ramosim solutis insignis.

Arbor parva ; ramulis puberulis. *Folia* breve petiolata, chartacea, lanceolata vel oblongo-lanceolata, acuta, basi late cuneata vel

rotundata, margine breviter sed distincte irregulariter dentata raro subintegra, 6–10 cm. longa, 1·5–2·5 cm. lata, supra glabra intense viridia, subtus glanduloso-lepidota ; petiolus 0·5–0·8 cm. longus, puberulus ; stipulae lanceolatae, 0·4–0·6 cm. longae, puberulae, caducae. *Flores masculi* in spicas breves laterales aggregati ; spicae 0·6–1·2 cm. longae ; bracteae parvae, ovatae, acutae, integrae, pluriflorae. *Calyx* in alabastro globosus, minutus, pubescens. *Stamina* 5–12 ; filamenta basi connata, apice libera, nonnunquam irregulariter, columnam filamentis ramosis simulantem efficientia. *Flores feminei* et *fructus* ignoti.

Tropical Africa. Nileland. Uganda : Western Prov. ; Mubuka River on the lower slopes of Ruwenzori, *Dawe* 595.

1269. **Gelonium angolense**, *Prain* [Euphorbiaceae-Crotoneae] ; species *G. zanzibarensi*, Muell Arg., similior, sed calyce femineo 3-lobo lobis eglandulosis, endocarpio coriaceo nec crustaceo aliisque notis facillime sejungenda.

Frutex dioicus, glaberrimus. *Folia* breve petiolata, subcoriacea, obovato-oblonga, breve cuspidata, basi cuneata, margine integra, 7·5–12·5 cm. longa, 3–6 cm. lata, supra opaca ; nervi laterales utrinsecus 6–8, indistincte prope marginem anastomosantes, reticulatio vix manifesta, nequaquam vesiculoso-punctata ; petioli 1 cm. longi. *Flores masculi* adhuc ignoti ; *feminei* in cymulas breve pedunculatas foliis oppositas aggregati. *Sepala* 3, eglandulosa, aequalia, ovata, margine ciliolata. *Discus* cupularis 3-lobus lobis sepalis alternantibus margine inter lobos staminodiorum rudimenta gerens. *Ovarium* 3-lobulare, glabrum ; styli lati, complanati, apice emarginati, patentes et carpidiis applicati. *Fructus* indistincte 3-sulcatus et parum 3-carinatus, minute apiculatus, 8 mm. latus, tardius loculicide simulque septicide in valvulas 6 secedens ; endocarpio crasse coriaceo. *Semina* ovoidea, arillo pulposo munita ; testa crustacea, foveolato-reticulata.

Tropical Africa. Lower Guinea : Angola ; Cazengo, *Gossweiler*.

A very distinct species easily separable from those hitherto described by the 3-merous female calyx.

1270. **Gelonium procerum**, *Prain* [Euphorbiaceae-Crotoneae] ; species affinis *G. africanae*, Muell.-Arg., a qua differt ramulis semper alternatim nec superne opposite foliosis, staminibus numerosioribus, foliis omnino integris.

Arbor procera, dioica, glaberrima, ramulis parum angulatis, ramorum cortice fisso, ligno albo duro. *Folia* breve petiolata, subcoriacea, ovata, subacuta obtusave, basi cuneata, margine integra, 3–7·5 cm. longa, 2–4 cm. lata, supra nitida ; nervi laterales utrinsecus 4–6 ; reticulatio creberrima distincta ; utrinque sed praesertim subtus distincte dense vesiculoso-punctata ; petioli 4–5 mm. longi. *Flores masculi* in cymulas subsessiles oppositifolias aggregati : alabastra globosa. *Sepala* 5 valde inaequalia, 3 (exteriora cum intima) suborbicularia ; cetera oblonga, obtusa, duplo breviora ; omnia margine ciliata, dorso eglandulosa. *Stamina* 20. *Flores feminei* et *capsula* adhuc ignota.

Tropical Africa. British East Africa : Ukamba ; south of Nairobi, *Elliott* 178.

XXIX.—PERSIMMONS.

(*Diospyros Kaki*, Linn. f. and *D. Roxburghii*, Carrière.)

W. Botting Hemsley.

In the Botanical Magazine for April, 1907 (t. 8127) a coloured figure, together with a description, is given of one of the numerous varieties of *Diospyros Kaki*, Linn. f., a species which is generally considered to include the 'Schitze' of the Chinese and the 'Kaki' of the Japanese. Much of interest relating to this fruit had to be left out of the Botanical Magazine, and it was announced there that a fuller account of it would follow in the *Kew Bulletin*. Pressure of other work has hitherto prevented this from being carried into effect, and even now it is more a guide to the literature of the subject that is offered here than a review or epitome of the same. Fortunately further investigations have led to the discovery of an error of some importance in the usually accepted synonymy of *Diospyros Kaki*, Linn. f. Concerning this point a somewhat heated controversy was carried on upwards of forty years ago. The chief disputants were Professor J. Decaisne, of the Jardin des Plantes of Paris, and Mr. E. A. Carrière, also of that establishment and the critical editor of the Revue Horticole. Briefly stated, Decaisne challenged the validity of certain species proposed and described by Carrière and he also asserted that Carrière had confused and interchanged the names of previously described species. Decaisne's views were widely accepted, and, to a great extent, have prevailed up to the present time. He maintained that *D. Kaki*, Linn. f. and *D. Schitze*, Bunge, were distinct species; that the species described by Carrière as *D. Roxburghii* was the true *D. Kaki*; and that the species recognised by Carrière as *D. Kaki* was in reality *D. Schitze*. Fortunately Decaisne backed his opinion by dried specimens, named in his own handwriting; a set of which he sent to Kew. Whether *D. Schitze*, Bunge, founded on specimens from the neighbourhood of Peking, is the same as *D. Kaki*, is, perhaps, not beyond doubt; and there is yet much to be done with the numerous specimens in herbaria from China and Japan named *D. Lotus*, Linn., before this point can be definitely settled.

The error referred to above in the synonymy of *D. Kaki* is the inclusion of *D. Roxburghii*, Carr., initiated by Decaisne and accepted by most subsequent writers. After the publication of the plate cited in the Botanical Magazine I examined more carefully the Indian specimens referred to *D. Kaki*, and came to the conclusion that they were specifically different, and further comparisons led to their identification with cultivated specimens and the figures of *D. Roxburghii*, Carr.

References are given in the Bibliography below to the publications in which appeared Decaisne and Carrière's discussion of the species question. Charles Naudin, who was an authority in the botany of many cultivated plants, also took up the subject. He defined what he regarded as *D. Lotus*, Linn., *D. chinensis*, Blume, and *D. Schitze*, Bunge, and he described *D. Psendo-Lotus* and

D. Kaempferi as new species. Not having access to Naudin's types at the present time I have not attempted a collation of the whole of his species.

The most important of the results of my investigations are the specific differences and native countries of *D. Kaki* and *D. Roxburghii*. *D. Kaki* is apparently confined to Central and Eastern China and Japan, whereas *D. Roxburghii* is a native of Eastern India and Western China. Whether *D. Roxburghii* is concerned in the parentage of any of the cultivated, edible persimmons is uncertain. I have found no reliable data. Clarke states that the natives of the Naga Hills "can eat the fruit." No other collector refers to *D. Roxburghii* as having an edible fruit; yet nearly all the specimens are named *D. Kaki*. These species are readily distinguished by their foliage as described below.

Diospyros Kaki, *Linn. f.*; inter species sino-japonicas floribus magnis ob folia tenuia saepius lata ampla facile distinguitur.

China. Flora Pekinensis: without locality, *Bretschneider*, 487, 489; without locality, *Everard*, comm. Rev. T. Preston; without locality, *Thunberg* in British Museum Herbarium; *D. Kaki* and *D. Lotus*, intermixed. Drawing of the same at Kew.

Japan. Yokoham, culta et sponte, *Maximowicz*, 1862; without locality, *C. Wright*; Nagasaki, wild and cultivated, *R. Oldham*, 528, 638; Tsu-sima Islands, Straits of Corea, *C. Wilford*, 756.

Cultivated in India. In the Raja's Garden at Panukka, Bhotan, *W. Griffith*, in British Museum Herbarium. Drawing of the same at Kew.

Cultivated in Europe. There are two specimens at Kew from the Paris Herbarium, cultivated in the Jardin des Plantes, and labelled in the handwriting of J. Decaisne, namely: *D. Schitze* Bunge, certissime, cum specim. Bungeanam comparate, H. Par. 1875, communicated by Prof. Dyer the same year, and *D. Schitze*, Bunge [syn.] *D. Kaki*, Carr. Rev. Hort. 1869; *D. costata*, Carr. H. Par. seminar. 1870; received direct from Decaisne, Novr., 1870. Hort. Kew, 1906, the specimen figured in the Botanical Magazine, t. 8127.

Besides the foregoing specimens, which undoubtedly belong to *D. Kaki*, there are others at Kew, collected in Central China by A. Henry and referred by me (Journ. Linn. Soc. xxvi. p. 69) to *D. Kaki*, which are not typical *D. Kaki* and possibly not the same species. These are numbered 1560, 1962, 3567 and 3861; and, in a note to 1962 and 3861, Henry states that they are the Yu-shih-tzu, or oil Persimmon, of the Chinese.

Synonymy and Coloured Figures of Named Varieties of Diospyros Kaki, Linn. f., Supplement, 1781, p. 439.

Diospyros Aurantium, *André* in Rev. Hort. 1887, p. 348, with a coloured figure.

Diospyros Bertii, *André* loc. cit., with a coloured figure.

Diospyros chinensis, *Blume*, Cat. Pl. Hort. Buitenz. 1823, p. 110, and Bijdr. Fl. Ned. Ind. 1825, p. 670, where he reduces it to *D. Kaki*; Naud. in Nouv. Arch. du Mus. d'Hist. Nat. Par. ser. 2, vol. iii, 1880, p. 221 (by error *sinensis*) t. 9, and in Bull. Soc. d'Acclim. de France, 1881, ser. 3, vol. viii, pp. 397–400.

Diospyros costata, *Carr.* in Rev. Hort. 1869, p. 284, and 1870, pp. 131 and 410, with a coloured figure.

Diospyros elliptica, *André* in Rev. Hort, 1887, p. 348, with a coloured figure.

Diospyros Kaempferi, *Naud.* in Nouv. Arch. du Mus. d'Hist. Nat. Par. ser. 2, vol. iii, 1880, p. 226, t. 10.

Diospyros Kaki, var. **costata**, *André* in L'Illustr. Hort. 1871, vol. xviii, p. 176, t. 78; W. P. H. in Gard. Chron. 1872, p. 576, f. 152, and op. cit. 1875, vol. ix, p. 777, f. 158; Report of the Secretary of Agriculture, U.S.A., for 1892, p. 265, t. 11.

Diospyros Lycopersicon, *Carr.* in Rev. Hort. 1878, p. 470, with a coloured figure.

Diospyros Mazelii, *Carr.* op. cit. 1874, p. 70, with a coloured figure; Naud. under *D. Schitze*, in Nouv. Arch. du Mus. d'Hist. Nat. Par. ser. 2, vol. iii, 1880, p. 222.

Diospyros Sahuti, *André* in Rev. Hort. 1887, p. 348, with a coloured figure.

Diospyros Schitze, *Bunge*, Enum. Pl. Chin. Bor. 1834, p. 42; Naud. in Nouv. Arch. du Mus. d'Hist. Nat. Par. ser. 2, vol. iii, 1880, p. 222, t. 11.

Embryopteris Kaki, *G. Don*, Gen. Syst. 1837, vol. iv, p. 41.

Ono Kaki, Kaempf. Amoen. Exot. 1712, p. 805, with a figure, p. 806.

Su-pim, Boym, Fl. Sinensis, 1656, t. M.

It may be useful to add the following references to writings on "*Diospyros Kaki*," though no attempt is made to discriminate between those dealing with the species as restricted in this paper and those in which there is a confusion of *D. Kaki* and *D. Roxburghii*.

Diospyros Kaki, *Thunb. Fl. Jap.* 1784, p. 157, excl. var. β; *Lour. Fl. Cochinch.* 1790, p. 226; *Ait. Hort. Kew*, ed. 2, 1813, vol. v, p. 478; *Roxb. Fl. Ind.* 1832, vol. ii, p. 527; *Loud. Arbor.* 1838, vol. ii, p. 1197; *Wight, Ic. Pl. Ind. Or.* 1842, vol. ii, t. 415; *DC. Prodr.* 1844, vol. viii, p. 229, excl. var. glabra; *Decne. in Gard. Chron.* 1870, p. 39; *Carr. in loc. cit.*, p. 312; *Hiern in Trans. Camb. Phil. Soc.* 1873, vol. xii, p. 227; *Franch. et Savat. Enum. Pl. Jap.* 1875, vol. i, p. 306; *Dupont in Rev. Hort.* 1880, p. 352, ff. 69–73, *et in L'Illustr. Hort.* 1880, vol. xxvii, p. 170; *Bretschn. Early Res.* 1881, pp. 5, 23, 29; *Clarke in Hook. f. Fl. Brit. Ind.* 1882, vol. iii, p. 555; *Hemsl in Journ. Linn. Soc.* 1889, vol. xxvi, p. 69; *W.W. in Gard. Chron.* 1893, vol. xiv, p. 682; *Sargent, For. Fl. Jap.* 1894, p. 50; *Useful Plants of Japan, described and illustrated* 1895, pp. 51–52, ff. 194–197; *Bretschn. Europ. Bot. Discov. in China*, 1898, p. 830; *Brandis, Indian Trees*, 1906, p. 432; *Honzo Zufu*, sine anno, fasc. lxiv, ff. 4–13.

Diospyros Roxburghii, *Carrière*; species ex affinitate *D. Kaki*, a qua differt imprimis folia crassiora fere coriacea lanceolata vel lanceolato-oblonga utrinque attenuata venis primariis prominentibus et corollae lobi latiores quam longi.—*D. Kaki* auctorum fere omnium, sed non Linn. f.

Eastern India. Assam: Khasia Hills, in various localities; *Nunklow*, 1668; *Mooshye*, 2363; Panee, without number, *Hooker and Thomson*; without locality, *G. Mann*, 186. Naga Hills, *C. B. Clarke*, 41150A.

Western China. Yunnan: Szemao, *A. Henry*, 9341, 11618A, 11618C, 11618D. Hupeh: Ichang and immediate neighbourhood, *A. Henry*, 1502.

Cultivated in Europe. H. Par. (Hortus Parisiensis), 1875; received through Prof. Dyer, viii, 1875; named *Diospyros Kaki*. *D. Roxburghii*, Carr., Herb. Mus. Par. Antibes (Alpes Maritimes) sub dio cult., 1871; named *D. Kaki*, Thunb., Herb. G. Thuret., comm. xi, 1871. All the specimens cited are in the Kew Herbarium.

One of the specimens from Antibes is in fruit; the rest of these cultivated specimens are barren shoots in a quite young condition. With the specimen named *D. Kaki*, H. Par. 1875, are male and female flowers in envelopes, labelled respectively: *Diospyros Kaki*, ♀, Hort. Thuret, and *Diospyros Kaki*, ♂, Hort. Thuret. The envelopes are inscribed as having been received at the same date as the leafy shoot on the same sheet; but they are certainly neither those of *D. Kaki* nor those of *D. Roxburghii*. Possibly they belong to *D. Lotus*, which was among the species cultivated in France at that date. This supposition is almost confirmed by the fact that there is a cultivated flowering specimen in the Kew Herbarium from the same source, received at the same time, and named *D. Kaki*, which I take to be *D. Lotus* Linn. It is labelled: Antibes, sub dio cult. 27 Mai, 1870.

Carrière states (Revue Horticole 1874, p. 71, under *D. Mazelii*) that his *D. Roxburghii* is not so hardy a tree as *D. Kaki*.

Early History of the Kaki.

Although, on the authority of Bretschneider, the Kaki is cultivated all over China, it does not figure among the vegetable products of China mentioned by Marco Polo, the pioneer of European travellers in that country, who resided there for a number of years towards the end of the thirteenth century. About the middle of the sixteenth century the first Jesuit missionaries landed in China, and it is to successive members of this order that we are indebted for our earliest knowledge of the Kaki. Bretschneider gives extracts from their writings, accompanied by comments in relation to his identifications. Ricci is the earliest (1615) cited, and he refers to a peculiar very common fruit which the Portuguese used to call Chinese Figs. Alvarus de Semedo (1643) has the following passage, as translated from the French by Bretschneider:—"There is a kind of fruit grown everywhere in China which they call *su zu* in their language. The Portuguese used to term it Red Fig. It bears, however, no resemblance to a fig, for it is of a red colour outside, contains a gold coloured pulp and seeds resembling almond kernels. Its shape is that of an orange, but it varies in size. It has the skin very soft and is of a delicious flavour. The best are grown in the colder parts of China, namely, in the provinces of

Honan, Shensi, Shansi and Shantung, especially in the last-named, where they used to dry them and send them off to the other provinces of the Empire. When dried this fruit resembles somewhat our figs, but it is superior in flavour."

Bretschneider remarks: "This is without doubt the *Diospyros Kaki*, Linn. f. (*D. Schitze*, Bunge), a very common fruit tree all over China, where a great many varieties of it are cultivated. The Chinese name of the fruit is schitze; in the Amoy dialect sutsu."

Passing over a number of writers who mention this fruit, but whose works we have not seen, we come to Boym (1656), whose Flora Sinensis is the earliest illustrated book on the natural history of China that Kew possesses, and probably the earliest extant. It is a thin quarto, printed in Latin at Vienna, and containing twenty-three plates illustrative of the flora or rather of the pomona, for they nearly all represent cultivated, edible fruits, several of which are not natives of China. The plates and letterpress are designated by the alphabet, from A onwards. *Diospyros Kaki* is rudely, though unmistakably represented by plate M, which is explained in the following terms: "Supim, Fructus Sinicus. Arbor et fructus supim apud Sinas tantum nascitur, est et aurei et purpurei coloris, magnus pomum excedit, carnem mollem et rubeam cum simili pellicula refert; ossicula hic inde interius abscondit; cum siccatur ficubus Europaeis simillimus est, et per multos annos conservatus, a Sinis Medicis saepenumero in pharmacis adhibetur. Egregius profecto fructus, in Quamtum, et Junkim regionibus Januario, Februario et Martio, sed in Xensy et Honan aliisque septentrionalibus Junio et Julio et Augusto maturescit. Arbor onerata purpureis hisce pomis, gratissimum exhibet aspectum, quae ne ab avibus decerpantur, continuis vigiliis custodiuntur."

The earliest record of the Kaki in English literature is probably that by Camellus (Kamel) in Ray's Historia Plantarum, Appendix, 1704, p. 54, where it is described under the name of Zapotl de China. This Appendix is entitled: Herbarum Aliarumque Stirpium in Insula Luzone Philippinarum Primaria Nascentium Syllabus, and the Kaki is placed under the head: "Arbores Pomiferae quarum Flos imo Fructui cohaeret. The author gives the Chinese name as Xicu; the Spanish as Chicoy, and the Portuguese, as Figocague. Evidently the Kaki was cultivated in the Philippines at that date, and it is still. The writer alludes to several varieties.

Bretschneider states that more than ninety drawings of the plants sent by Kamel were published by Petiver in his Gazophylacium Naturae et Artis, and a leaf, fruit and seed of the Kaki are represented in plate 45, under the name of Zapotl, with a reference to the Sylloge of Camellus.

In 1781 Linnaeus the younger's description appeared under the binomen *Diospyros Kaki*, and passing over a number of references given in the bibliography at the end, we come to the introduction and cultivation of the Kaki in England, which was effected through the agency of Sir Joseph Banks, in 1789.

The following popular account of the Kaki is extracted from Sargent's "Forest Flora of Japan."

"Although we have learned to look upon Japan as the home of the Persimmon, which is intimately associated with the expression of modern Japanese art, it is doubtful if either of the species of Diospyros commonly encountered in that country is really indigenous in the empire, where they were both probably introduced, with many other cultivated plants, from China. The more common and important of the two species is, of course, the Kaki, Diospyros Kaki, which is planted everywhere in the neighbourhood of houses, which in the interior of the main island are often embowered in small groves of this handsome tree. In shape it resembles a well-grown Apple-tree, with a straight trunk, spreading branches which droop towards the extremities and form a compact round head. Trees thirty or forty feet high are often seen; and in the autumn, when they are covered with fruit, and the leaves have turned to the colour of old Spanish red leather, they are exceedingly handsome. Perhaps there is no tree, except the Orange, which, as a fruit-tree, is as beautiful as the Kaki. In central and northern Japan the variety which produces large orange-coloured ovate thick-skinned fruit is the only one planted, and the cultivation of the red-fruited varieties with which we have become acquainted in this country is confined to the south. A hundred varieties of Kaki, at least, are now recognised and named by Japanese gardeners, but few of them are important commercially in any part of the country which we visited, and, except in Kyōto, where red Kakis appeared, the only form I saw exposed for sale was the orange-coloured variety, which, fresh and dried, is consumed in immense quantities by the Japanese, who eat it, as they do all their fruits, before it is ripe, and while it has the texture and consistency of a paving-stone.

"Diospyros Kaki, or an allied species, is hardy in Peking, with a climate similar to that of New England, and fully as trying to plant life; it fruits in southern Yezo, and decorates every garden in the elevated provinces of Central Japan, where the winter climate is intensely cold.

"There appears, therefore, to be no reason why it should not flourish in New England if plants of a northern race can be obtained; and, so far as climate is concerned, the tree, which, in the central mountain districts of Hondo, covers itself with fruit year after year, will certainly succeed in all our Alleghany region from Pennsylvania southward. In this country we have considered the Kaki a tender plant unable to survive outside the region where the Orange flourishes.

"This is true of the southern varieties which have been brought to this country, and which may have originated in south-eastern Asia, in a milder climate than that of southern Japan, for the Kaki is a plant of wide distribution, either natural or through cultivation. But the northern Kaki, the tree of Peking and the gardens of central Japan, has probably not yet been tried in this country. If it succeeds in the northern and middle states, it will give us a handsome new fruit of good flavour, easily and cheaply raised, of first-rate shipping quality when fresh, and valuable when dried, and an ornamental tree of extraordinary interest and beauty."

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XXX.—MISCELLANEOUS NOTES.

Maerua angustifolia.—This name has been applied to three distinct species: by A. Richard in 1831, and by Schinz in 1888 and 1897. *Maerua angustifolia*, A. Rich. in Guill. et Perr., Fl. Seneg. 1831, p. 29, t. 8, is a native of Senegal. Richard in 1847 carefully distinguished it from *M. oblongifolia*, A. Rich. (Tent. Fl. Abyss., vol. i, p. 32, t. 6), to which it is undoubtedly allied; but Oliver, Fl. Trop. Afr., vol. i, 1868, p. 85, reduced it to that species. In 1903, however, Gilg restored specific rank to *M. angustifolia*, A. Rich. (Engl. Jahrb., vol. xxxiii, p. 225); and comparison of the excellent figures accompanying Richard's descriptions is sufficient to justify the recognition of *M. angustifolia* as a distinct species.

Misled by Oliver's reduction of *M. angustifolia*, A. Rich., Schinz in 1888 described a new species from German South-West Africa under the same name (Abh. Bot. Ver. Brand., vol. xxix, p. 48). In 1897, however, Schinz transferred *Boscia angustifolia*, Harv. (1860) to *Maerua* as *Maerua angustifolia* (Harv.) Schinz (Bull. Herb. Boiss., vol. v, app. 3, p. 97). At the same time he reduced *Maerua angustifolia*, Schinz (1888) to *M. Guerichii*, Pax in Engl. Jahrb., vol. xix, 1894, p. 135.

Gilg in 1903, after restoring *M. angustifolia*, A. Rich., to specific rank, found it necessary to provide another name for *M. angustifolia*, Schinz (1888), and having overlooked Schinz's identification of that species with *M. Guerichii*, Pax, proposed for it the new name *Maerua ramosissima*, Gilg (Engl. Jahrb., vol. xxxiii, p. 227). Gilg (l.c. 228), identified *Boscia angustifolia*, Harv., with *Maerua Currori*, Hook. f., from description. This, however, is incorrect. The two species are not even closely allied. A new name has accordingly to be found under *Maerua* for *Boscia angustifolia*, Harv. and it is now proposed to call it *Maerua stenophylla*, Sprague. The synonymy of the three species under consideration is as follows :—

Maerua angustifolia, *A. Rich.* in Fl. Seneg., 1831, p. 29, t. 8 ; Tent. Fl. Abyss., vol. i, 1847, p. 32, in obs. *M. oblongifolia*, Oliv. Fl. Trop. Afr., vol. i, 1868, p. 85, partim, non A. Rich.

Maerua Guerichii, *Pax* in Engl. Jahrb., vol. xix, 1894, p. 135. *M. angustifolia*, Schinz in Abh. Bot. Ver. Brand., vol. xxix, 1888, p. 48, non A. Rich. *M. ramosissima*, Gilg in Engl. Jahrb., vol. xxxiii, 1903, p. 227.

Maerua stenophylla, *Sprague*, nom. nov. *Boscia angustifolia*, Harv. in Harv. et Sond. Fl. Cap., vol. i, 1860, addenda p. 19* ; Thes. Cap. t. 134. *Niebuhria angustifolia*, Harv. Gen. ed. 2, 1868, p. 12. *Maerua angustifolia*, Schinz in Bull. Herb. Boiss., vol. v, 1897, app. 3, p. 97, non A. Rich., nec Schinz (1888).

T. A. S.

Botanical Magazine for May.—The plants figured are *Rhododendron lacteum*, Franch. (t. 8372) ; *Deinanthe caerulea*, Stapf (t. 8373) ; *Oncidium Sanderae*, Rolfe (t. 8374) ; *Lonicera Henryi*, Hemsl. (t. 8375) and *Villaresia mucronata*, Ruiz et Pav. (t. 8376).

The Rhododendron is a handsome species from China allied to *R. Falconeri*, Hook. f. The seeds were collected by the Abbé Delavay and a plant raised from them was sent to Kew in 1888 from the Jardin des Plantes, Paris. The subject of the illustration was received from Mr. F. D. Godman, South Lodge, Horsham, who has been the first to flower the Rhododendron in this country.

The *Deinanthe* is an interesting Saxifragaceous plant from China, seeds of which were sent home by Mr. E. H. Wilson from Nant'o in Hupeh. The only other member of this genus so far known is *D. bifida*, Maxim., from Southern Japan. *D. caerulea* was originally discovered by Mr. A. Henry at Hingshan, Hupeh. The plant figured was raised from seed by Mr. H. J. Elwes, Colesborne, Cheltenham, and flowered in Mr. Dimsdale's garden, Ravenhill, Lechlade.

Oncidium Sanderae is an interesting addition to the small group of species known as Butterfly orchids. The only other known species are *O. Papilio*, Lindl., from Trinidad and Venezuela, and *O. Kramerianum*, Reich. f., from Colombia and Ecuador. The species figured was collected by Mr. Forget on behalf of Messrs. F. Sander & Sons in the Moyobamba district, Peru.

The Honeysuckle (*Lonicera Henryi*) is another introduction due to the labours of Mr. E. H. Wilson in Hupeh, but the plant was originally discovered by Mr. A. Henry. The species belongs to the section *Nintooa* to which *L. Giraldii*, Rehder (*see* t. 8236), also

belongs. We are indebted to the Right Hon. L. Harcourt for the first specimen of this plant to flower in England. It is a free growing, evergreen climber which promises to be hardy.

Villaresia mucronata, a member of the natural order *Icacinaceae*, is a native of Concepcion in South Chile. It forms a handsome evergreen tree very like the common holly, but it is only hardy in a climate like that of the south-west of England. The material from which the illustration was taken, was sent by the Right Hon. the Earl of Ilchester from Abbotsbury.

Forestry in Hawaii*.—This report, containing 231 pages of letterpress and 45 pages of illustrations, deals with the main features of the work of the Department for the years 1909–10 in its three Divisions—Forestry, Entomology and Animal Industry. Forestry occupies upwards of 80 pages, and detailed accounts are given of the work of afforestation which is being carried on in the various islands in the Territory.

Forestry in Hawaii is conducted with two principal objects in view as set forth in the preface, page 3, in the following words :—

" The activities of the Division of Forestry can readily be divided into two parts : First, the creation and administration of forest reserves, for the most part areas of native Hawaiian forest covering important watersheds that it is advisable to keep intact for the protection of the supplies of water needed for irrigation, power development or domestic uses. Second, the extension of a forest cover over areas of waste or barren land, or in sections that can be used to better advantage for growing trees than for any other purpose."

For the first of these objects forest reserves have been created about the head-waters of streams, the watersheds and catchment areas, thus placing a limit on the cutting surface. This was made necessary by the reduction of the natural water supply consequent on the indiscriminate clearing of land for agricultural purposes, the growth of sugar-cane, coffee and other crops. For this class of forest, Hawaiian trees are relied on. Some of the chief are " Ohia Lehua " (*Metrosideros polymorpha*), " Koa " (*Acacia Koa*), " Mamane " (*Sophora chrysophylla*), and " Kukui " (*Aleurites triloba*). The second class of forest which is intended to supply the future timber requirements of the region, is being established on land which is of little value for agricultural purposes. Much of it is under Government control, but companies and private land owners are encouraged to plant, the experience of the Division's officers being given when required. This class of forest is composed almost exclusively of exotic trees. *Eucalyptus robusta*, *E. globulus* and *E. citriodora* are planted largely, and on page 50 a list of 25 Eucalypts is given which are being tried at the Haleakala Ranch. Two coniferous trees which obtain favour are *Cupressus macrocarpa* and *Cryptomeria japonica*. The kinds of trees under serious trial appear to be limited, and it is surprising that the Australian Acacias and the more important pines and hardwoods of the Southern United

* Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii for the Biennial Period ending December 31st, 1910.

States are not in evidence. Reference is, however, made to various experiments which are being carried on in the introduction of trees and shrubs from other countries, so probably these are included.

The co-operation of government and private landowners in afforestation is advocated, and apparently, with this end in view, the Division strives to inculcate a love for trees and a desire for forest conservation in the minds of the general public, for trees are distributed free from government nurseries to planters of small numbers and at a trifling cost to those who plant on a more ambitious scale, while on Arbor Day they are given to all who may apply. Though in many ways the idea is an admirable one it goes a very short way towards satisfying the demands of practical forestry, and probably too much is made of it in the report.

The Superintendent of Forestry deals with the areas planted in the various islands, expenditure and experiments which are being made with various kinds of timber, while the Forest Nurseryman reports on the work of his department, the interchange of seeds, sale and distribution of plants, advising of private planters, the Tantalus Forest and Nuuanu Station.

The Botanical Assistant, in an interesting report, describes a project for the botanical exploration of certain out-of-the-way portions of the Hawaiian group, a botanical journey in North Kona, Hawaii, and the herbarium connected with the Division. Lists on interesting plants found on the above journey are given, and the following species reported to be new to science, discovered at an elevation of 2000 feet in the mountains at Punaluu, Oahu, are recorded. *Euphorbia Rockii*, C. N. Forbes, *Viola oahuensis*, C. N. Forbes, *Lysimachia longisepala*, C. N. Forbes, *Scaevola Swezeyana*, Rock, *Pittosporum Hosmeri*, Rock, *Sideroxylon rhynchospermum*, Rock, *Lysimachia glutinosa*, Rock, *Dubantia Waialealae*, Rock.

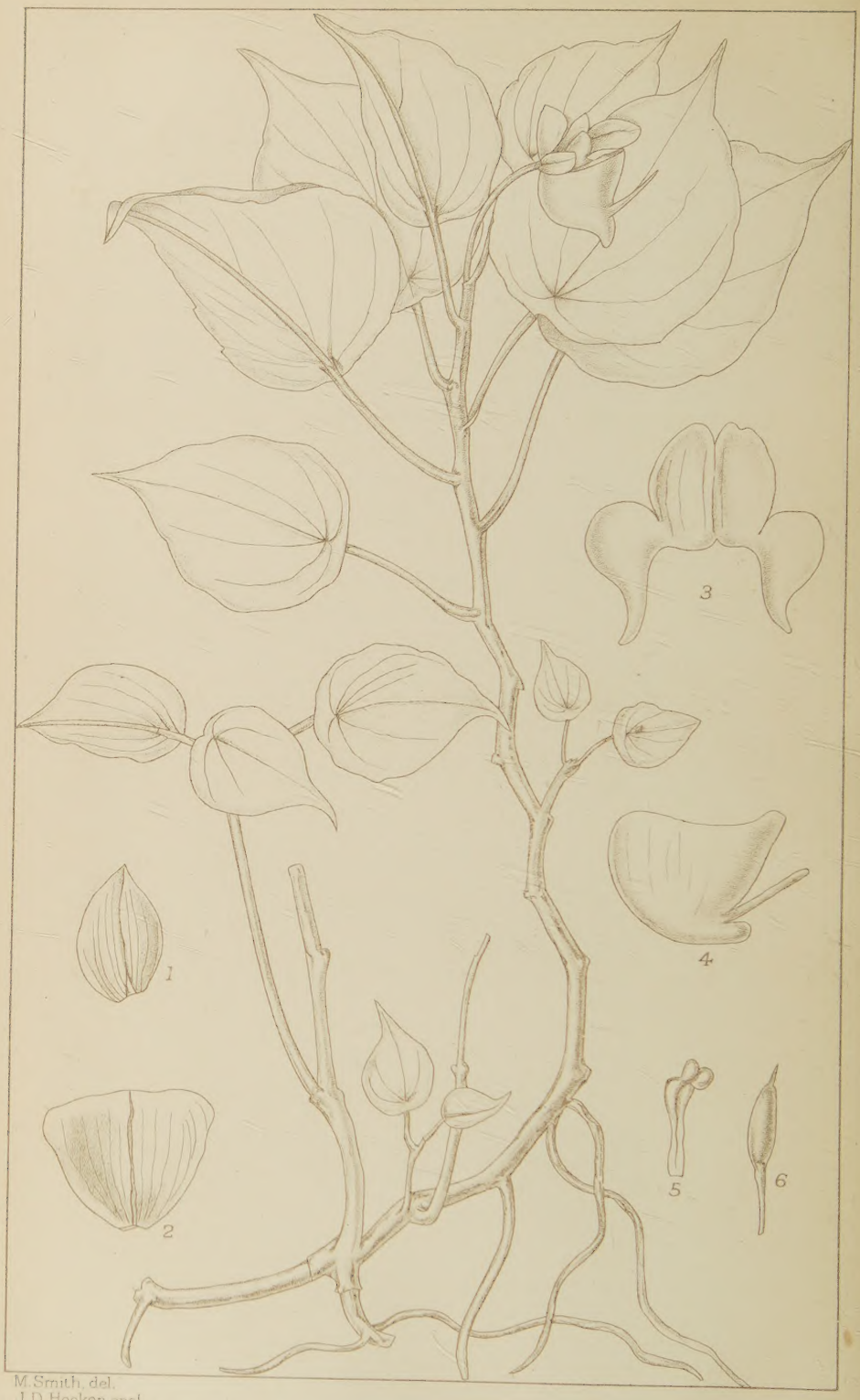
Illustrations of the following plants are given:—*Wilkesia Gymnoxiphium*, Gray., *Gossypium drynarioides*, Seem., *Lobelia Kauaensis* (Gray) Heller., *Brighamia insignis*, Gray., *Lobelia Gaudichaudii*, DC., *Argyroxiphium sandwicense*, DC. var. *macrocephalum*, Hbd., *Alectryon macrococcum*, Radlkf., *Pittosporum Hosmeri*, Rock, *Sideroxylon rhynchospermum*, Rock, *Dubantia Waialealae*, Rock.

In addition to the principal officials of the Division, 39 District Officers, 49 Fire Wardens and one Forest Ranger are included in the staff.

The report of the Superintendent of the Division of Entomology records the steps taken to combat various insect plagues which were causing harm to the melon, alligator pear, chrysanthemum and other plants. Details concerning experiments made with various washes are recorded. Elaborate arrangements have been made for the inspection of plants and fruits arriving from other countries, and the vigilance of the several officers has been rewarded by their being able to exclude a number of insect and fungoid diseases which are known to create serious harm elsewhere.

The latter pages of the report are devoted to the Division of Animal Industry, and, amongst other things, detailed accounts are given of efforts which are being made to improve the breeds of cattle and horses in the Territory and the treatment and prevention of various diseases of animals.

W. D.



M. Smith, del.
J. D. Hooker anal.

Impatiens peltata.

460. 7.36. 174/57. 1125.7.11.

To face page 249.]

Maloy & Sons, Lith.